THE IRON TRADE REVIEW

VOLUME XXXIX CLEVELAND, MAY 17, 1906 NUMBER 20

C ONTINUED BUYING

BY THE RAILROADS INDICATED BY EARLY ORDERS.

Molders' Strike Felt In Pig Iron Market.—Great Activity On The Lakes.—Small Tonnage Of Ore On Docks.

The very great prosperity of the railroads, so closely connected with that of the iron and steel business, has been reflected for many months in unprecedentedly heavy purchases of rails, and that this policy of liberal buying is not to be abandoned is clearly shown by the heavy orders already placed and others pending. It is estimated that 1,000,000 tons of steel rails for 1907 delivery have been under negotiation and that fully half of this tonnage has been placed. The Illinois Steel Co., which has already been patronized liberally by western railroads, will probably book orders for 1907 considerably in excess of its present capacity, with the expectation that the new mill at Gary, Ind. will be completed in time to assist in filling orders.

Molders' Strike Depressing. The strike of molders in a number of leading manufacturing cities has had a depressing effect on foundry grades of pig iron, and causes a tendency toward weakness in some places, especially in the Chicago district, where southern iron has been bought from 25 to 50 cents per ton lower than recent quotations. Ohio furnaces have shown considerable eagerness for business. Little Bessemer and foundry iron is available in the Pittsburg district, and a consumer of the former was not able to get 20,000 tons for June and July delivery. Large sales of basic and malleable have been made recently, the heavy buying of basic being principally in the east.

Tin Makes New Record. The very high price of tin is expected to have effect on the tin plate market. Tin has this week reached the highest quotation on record. As the three advances in the price of tin plate during the last eight months have been justified by advances in steel, and as the advance in tin is equal to more than 35 cents per box of tin plate, higher prices of tin plate are justified. Another fact which tends toward higher prices of tin plate and sheets is inability of the mills to provide an adequate supply of sheet and tin bars, which within a few days has caused a further curtailment of the capacity for steel bars. The market for tubes is firm at $30 in spite of the efforts of some heavy buyers to obtain concessions.

Structural Material. The demand for structural material shows some diminution, but mills are very busy on old orders. The San Francisco demand has not been heard from to any appreciable extent. A heavy tonnage will soon be required for track elevation at Chicago. Among the orders of a few days is one for 4,500 tons for the St. Louis building taken by the Jones & Laughlin Steel Co.

Plates for Eastern Cities. Specifications on sheets are heavy, especially in the Pittsburg district. The demand from San Francisco is for a considerable tonnage. Philadelphia and Brooklyn will require from 35,000 to 40,000 tons of plates for municipal improvements at an early date. The pending business on merchant pipe has not been closed, and prices are low. Quotations of boiler tubes are also ragged.

Ore Shipments Are Large. Since the settlement of the strike of longshoremen on the lakes there has been great activity and in spite of the loss of 10 days, the shipments for the month will be very large. The demands of firemen and other lake employes for increased wages are proving troublesome, but it is believed that a strike will be averted. The amount of ore on dock May 1, 1906 was 1,791,090 tons, the smallest tonnage on dock May 1 since 1900. The total amount of ore moved over lake Erie docks from furnaces in the full year ending May 1, 1906 was 28,984,358 tons against 20,057,070 tons for the preceding year.

LONGSHOREMEN'S STRIKE ENDED.

The strike of the longshoremen, which tied up the shipping of the great lakes for the first ten days of May, ended in its complete collapse without any interference on the part of vessel or dock interests. The strike died of internal dissension; the mates' union, in behalf of which it was ordered, generally failed to recognize it and a few days of inactivity satisfied the longshoremen that a strike without something to strike for was not likely to win. Accordingly, President Keefe came to Cleveland last week and after conferences with his leaders the fight was given up on Thursday. Representatives of the longshoremen and of the dock interests went into conference and as the result an agreement on terms for the next two years was signed. The ten-hour day was granted, in return for which the union gave up its demand for increased wages. A joint committee will be named to take up and settle all later differences. The dock laborers were prompt to return to work and already great progress has been made toward unloading the ore freighters which crowded every harbor along the lower lakes. Minor labor differences are being amicably adjusted and no further labor trouble is anticipated. The outcome of the strike was a severe blow to the prestige of President Keefe of the longshoremen and will have an important effect in steadying the labor situation on the lakes.

LATE NEW YORK NEWS.

(Special Telegram.)

New York, May 16.—Late rail sales include the following for 1906: Chesapeake & Ohio, 15,000 additional; Baton Rouge, Hammond & Eastern, 6,200; Oneida Railway, 6,000; for 1907: Wisconsin Central, 5,000; New York Central, 5,500; Chicago & Great Western, 2,200.

The annual meeting of the Tennessee Coal, Iron & Railway Co. has been postponed until May 21.

THE WEEK IN IRON CENTERS.

PITTSBURG.

Bessemer and Foundry Pig Iron Scarce.—Advance in Tin Plate Expected.

OFFICE OF *The Iron Trade Review*,
521 PARK BUILDING, May 16.

This market during the week under review has been comparatively quiet and nothing out of the ordinary has transpired. There has been some buying of pig iron, but it has been for the most part in small lots. Steel is still very scarce, this being particularly true of open-hearth and the leading interest on this account has been compelled during the past week to close down one or two of its bar mills, material usually going to them being demanded for other interests having contracts which must be filled. Sheet bars and billets have not improved as far as the supply is concerned and conditions are about as they have been for the past two or three weeks.

There has been an intimation that the price of tin plate will be advanced before the first of next month on account of the high market price of pig tin which has advanced in the New York market eleven cents per pound within the past ten days.

In structural material the new work undertaken by contractors has been light, the impression prevailing that it is quieting down for the summer. This will not affect the mills for a long time ahead, however, as they are filled for several months on old contracts. The plate market has shown some improvement and sheets are in very heavy demand in all parts of the country.

Pig Iron.—The sale of 20,000 tons of Bessemer pig iron to the Republic Iron & Steel Co., last week has been the latest big transaction. One large interest sought 20,000 tons of Bessemer for June and July delivery from the Bessemer association, but could not secure it. The American Bridge Co., bought 250 tons of No. 2 southern and 750 tons of No. 4 southern for its St. Louis plant and Westinghouse interests bought several thousand tons of pig iron for one of their eastern steel casting plants. It is reported that the United Steel Co., at Canton, O., bought 5,000 tons of basic at slightly below the market price. There are several small inquiries out for foundry iron, but the unsettled condition of affairs regarding the molders' strike is probably having its effect reflected on immediate buying.

Bessemer pig iron is held strong at $17.25 to $17.50 valley for delivery during the remainder of the second quarter. Basic iron is quoted strong at $17, valley furnaces and northern No. 2 foundry at $16.75, valley, although $16.50 could be done for second half of the year. Northern gray forge is quoted $16.50 to $16.60, delivered Pittsburg. We quote:

Bessemer Valley	$17.25 to 17.50
Bessemer, Pittsburg	18.10 to 18.35
No. 1 Foundry, Pittsburg	18.00 to 18.25
No. 2 Foundry, Pittsburg	17.50 to 17.75
Gray Forge, Pittsburg	16.50 to 16.60
Basic, Valley	17.00 to 17.25
Basic, Pittsburg	17.85 to 18.10

Ferro-Manganese.—For spot delivery ferro-manganese, foreign 80 per cent is quoted at $90 but for delivery during June $80 is quoted. For extended delivery a New York importer has offered ferro-manganese at $75.

Steel Billets.—Bessemer steel billets, while the scarcity is not as pronounced as it was a week ago, are hard to obtain and the prevailing quotations are $27 to $27.50 and in some instances better than $28 has been paid for immediate delivery.

Skelp.—No change is reported in skelp this week. There has been but very little new business, although specifications against old contracts are good. We quote:

Bessemer grooved, 1.57½c to 1.60c; sheared, 1.65c to 1.70c; basic grooved, 1.60c to 1.65c; sheared, 1.65c to 1.70c; iron skelp, grooved, 1.65c to 1.70c; sheared, 1.80c to 1.85c.

Hoops and Bands.—Mills are busy on old contracts against which specifications are steady and in good volume, but new business is light. There has been no change in prices and we continue to quote:

Hoops, 1.90c in carload lots, and 2c on less than carload lots, bands, 1.50c base, half extras as per standard steel card. Prices f. o. b. Pittsburg.

Cotton Ties.—While it is estimated that with a good crop in the cotton producing states there are still several hundred thousand bundles of ties yet to be contracted for, the business during May has been light after the April rush and practically no cotton ties have been sold at the 85½c base. An advance of one half cent will be made in June.

Muck Bar.—There has been practically no inquiry for the past 30 days and we quote all pig metal muck bar nominally at $28.50 to $29 and part scrap bar at $26.50.

Structural Material.—Inquiry for new construction, according to the leading construction companies has quieted down to a considerable extent, the only new job reported from this district being for a new open-hearth building for the Harrison, N. J., plant of the Crucible Steel Co., secured by the McClintic-Marshall Co. The specifications against existing contracts have been enormous, however, and no difference will be noted by the mills for several months to come. We quote:

Beams and channels, 15 in., and under, 1.70c; over 15 in., 1.80c; zees, 1.70c; tees, 1.75c; angles from three to six inches, inclusive, 1.70c; over six inches, 1.80c; universal and sheared plates, 6¼ inches and wider, 1.60c base.

Plates.—The demand for plates has improved and considerable interest is shown in the municipal improvements at Philadelphia and Brooklyn where contracts will soon be let for between 35,000 and 40,000 tons of plate for pipe work. The car companies are insistent upon deliveries of plates and have about all the work they can turn out for the remainder of the year. There are several roads with inquiries out for new steel cars which will be placed as soon as the car companies get out of their present rushed condition. The plate work for two new battleships will also be contracted for within the next two months by coast ship yards. We quote:

Tank plate ¼-inch thick, 6¼ to 100 inches, 1.60c f. o. b. mill, Pittsburg. Extras are as follows per 100 pounds, boiler and flange steel plates, .10c; A. B. M. A. and ordinary firebox steel plates, .20c; still bottom steel, .30c; marine steel, .40c; locomotive firebox steel, .50c; all sketches excepting straight taper plates, varying not more than four inches, in width at ends, narrowest end not being less than 30 inches, .10c, complete circles, .20c. Plates in width over 100 inches up to 110 inches, .05c; over 110 inches up to 115 inches, .10c; over 115 inches up to 120 inches, .15c; over 120 inches up to 125 inches, .25c; over 125 inches up to 130 inches, .50c; over 130 inches, 1.00c. Gauges under ¼ inch to and including 3-16 inch plates on thin edges, .10c; under 3-16 inch to and including No. 8, .15c; under No. 8 to and including No. 9, .25c. Five cents extra for less than carloads. Terms net cash in 30 days.

Rails and Track Material.—The Carnegie Steel Co., secured a contract for 90,500 tons of steel rails from the Pennsylvania lines for 1907 delivery, this being its proportion of the 200,000 tons placed. The Wabash contracted during the week for 3,000 tons for 1906 delivery and 10,000 for 1907 delivery. The Shreveport & North Eastern closed for 3,800 tons for this year delivery. The Baltimore & Ohio will

soon be in the market for a big tonnage for 1907. We quote:

Fifty pounds and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; light rails, 16 pounds, $30; 20 pounds, $28.50; 25 to 45 pounds, $28.50; angle bars for standard sections, 1.50c; spikes, $2.05 to $2.10.

Merchant Bars.—With conditions quiet and but little business being done in the way of new contracts, prices have remained unchanged and we quote as follows:

Common iron bars, 1.55c, Pittsburg in carload lots, 1.65c in less than carloads; for western shipment 1.50c base Pittsburg; Bessemer steel bars, 1.50c; plow and cultivator, 1.50c net; channels, angles, zees and tees, under 3 inches, 1.60c, all f. o. b. Pittsburg. The following differentials are maintained on steel: Less than 2,000 pounds .10c advance, less than 1,000 pounds, of a size, .30c advance.

Merchant Pipe.—As far as can be learned none of the pending contracts for line pipe have been closed. Considerable business has been done in the smaller sizes, but prices are still very low, the extreme discount being 81 per cent and 5 off. We quote pipe, consumers' carloads, with jobbers' carloads one point higher, subject to above mentioned discount.

	Steel		Iron	
Consumer's Carloads	Black	Galv.	Black	Galv.
⅛ and ¼ inch	71	55	67½	51½
⅜ inch	73	59	69½	55½
½ inch	75	63	71½	59½
⅝ to 6 inches	79	69	76	66
7 to 12 inches	74	59	71	55½
EXTRA STRONG PLAIN ENDS.				
⅛ to ⅜ inch	64	52	60½	48½
¼ to 4 inches	71	59	67½	55½
4½ to 8 inches	67	55	63½	51½
Double extra strong plain ends, ¼ to 8 inches	60	49	56½	45½

Boiler Tubes.—The demand for locomotive boiler tubes continues good as it has for several months past and deliveries have been heavy. On merchant boiler tubes the prices are weak and while no change has been made in the official quotations given below, a concession of four points is made. We quote on merchant boiler tubes 22 feet and under the following official list:

	Steel	Iron
1 to 1¼ inches	46	41
1¼ to 2¼ inches	58	41
2¼ inches	60	46
2¾ to 5 inches	66	53
6 to 13 inches	58	41

Less than carload lots two points less.
2½ inches and smaller, over 18 feet, 10 per cent net extra.
2¾ inches and larger, over 22 feet, 10 per cent net extra.

Merchant Steel.—Producers are holding firmly to the 1.50c base on steel bars and have refused business offered on condition of a concession. The actual new business placed during the past two weeks has been comparatively light. The leading interest has temporarily shut down part of its steel bar capacity on account of a scarcity of billets which have been required for outside contracts. We quote:

Cold rolled and ground shafting, 50 per cent off in carload lots, and 45 off in less than carloads, delivered in base territory; tire steel, 1.70c to 1.80c; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flat, 1.50 to 1.55c; smooth finished machinery steel, 1.90c to 2c; toe calk, 2.05c to 2.10c. The price of planished and machine straightened tire is 1.70c base half extras as below. Iron finished tire up to 1½ inch by ½ inch, 1.65c base half extra tire list. Iron finished tire 1½ inch by ½ inch and over to be sold on regular bar basis of 1.50c base, half extra steel card.

Sheets.—The demand for black and galvanized sheets has been very heavy from all parts of the country and prices are being strictly maintained. The scarcity of sheet bars still continues to be a feature and on this account many sheet mills have been closed down entirely and others will be closed unless conditions improve. We quote:

Black steel sheets, box annealed, cold rolled, one pass: Nos. 11-12, 2c; Nos. 13-14, 2.05c; Nos. 15-16, 2.10c; Nos. 17-21, 2.15c; Nos. 22-24, 2.20c; Nos. 25-26, 2.25c; No. 27, 2.30c; No. 28, 2.40c. Galvanized, Nos. 10-11, 2.35c; Nos. 12-14, 2.45c; Nos. 15-16, 2.55c; Nos. 17-21, 2.70c; Nos. 22-24, 2.85c; Nos. 25-26, 3.05c; No. 27, 3.25c; No. 28, 3.45c. Corrugated roofing, $1.70 per square for No. 28 painted, 2½-inch corrugation; $3.05 per square for No. 28 galvanized, 2½-inch corrugation. Quotations f. o. b. Pittsburg on large lots.

Tin Plate.—The leading canning interests, while they have protected themselves, have been waiting to some extent for reports on crop conditions and as a result the new business has been limited. Mills not closed down on account of scarcity of semi-finished material have business to keep them going for at least 60 days. The high price of pig tin is talked of as forcasting an advance in tin plate before June 1 if present prices prevail at that time.

We quote: $3.60 per base box, f. o. b. Pittsburg, 14 x 20 100-pound cokes, terms 30 days, less two per cent off for cash in ten days.

Wire and Wire Nails.—As far as new business is concerned the summer dullness has begun to be felt, but specifications against existing contracts have been steady and heavy and mills can be kept busy on these until July 1 at least. We quote unchanged, as follows:

Wire nails, jobbers' carload lots, $1.85; retailers' carload lots, $1.90, and less than carload lots, $2; painted barb wire, $2 for jobbers in carloads; retailers in carloads, $2.05, and less than carloads, $2.15, with 30c for galvanizing, plain wire $1.70 to jobbers and $1.75 by carload.

Old Material.—The scrap market is still quiet and prices have not changed. The only sale of any note during the week was to Sharon on the base of $15.50 for heavy melting. We continue to quote: Heavy melting stock, $15 to $15.50; No. 1 cast scrap, $15 to $15.50; cast borings, $8.75 to $9; bundled sheet scrap, $13.50; No. 1 railroad wrought, $17 to $17.25; No. 1 yard faggoting scrap, $17; low phosphorus scrap, $18 to $18.50; wrought turnings, $11 to $11.50; busheling scrap, $14 to $14.50; iron axles, $25 $1.85; retailers' carload lots, $1.90, and to $26; old steel rails, rerollers, $15.50 to $15.75.

Coke.—Strictly standard Connellsville furnace coke is quoted $2.50 to $2.60, ovens and foundry coke at $2.60 to $2.65. The estimated output for the Connellsville region for the week ending May 5 was 271,534 tons and for the lower Connellsville region 102,838 tons.

CHICAGO.

Heavy Tonnage of Rails Ordered.—Pig Iron Market Quiet.

Office of *The Iron Trade Review*,
1164 Monadnock Block, May 15.

A large tonnage of rails has been placed with mills in the last few days. Among the purchasers was the Burlington road, which contracted for 50,000 tons; the Illinois Central, which bought 20,000 tons; the Wisconsin Central, 5,000 tons; Chicago Great Western, 2,500 tons, and the Nickel Plate, 5,500 tons. Pacific roads are said to be figuring on 300,000 tons, and eastern trunk lines are quoted for an equal tonnage. Practically all the western business has been placed with the Illinois Steel Co. This mill has sold substantially 500,000 tons of its 1907 output since it opened its books for that delivery a few weeks ago, and there are enough contracts virtually closed, although not yet placed, to more than take up the balance of its capacity. Additional tonnage is coming forward at a rapid rate, and it is believed the company will heavily oversell itself for 1907 in the expectation that its new mill at Gary, Ind. which it is understood will have a capacity of 2,000 tons a day, will be completed before the expiration of that year.

Buying of pig iron has subsided and there are few purchasers in the market for lots over 500 tons. The competition of Ohio furnaces prevents any strength-

ening of local prices and Northern No. 2 foundry is offered at $18.30 to $18.50 Chicago. Considerable shading is also being done among southern furnaces, sales having been made in the week under review on a basis lower than $13.75 Birmingham for No. 2 foundry. The principal transaction in rolled shapes, the sale of 2,500 tons of billets, was made by an eastern mill to a local consumer. Boiler tubes are weak and adherence to the printed schedule is a thing of the past. A large amount of fabricated steel is being figured on in connection with track elevation work in Chicago and for bridge renewals, conspicuous among the latter being the inquiry from the Chicago & Northwestern railway for 4,000 to 5,000 tons. Universal and light sheared plates are both in good demand, and early deliveries of either are hard to obtain. Black and galvanized sheets are moving freely, producers having no difficulty in keeping their mills sold well ahead. Bar iron is still quoted at 1.66½c Chicago, and is in good demand. New tonnage in steel bars continues light, although specifications show no decreasing tendencies. Wire materials are abnormally active for this time of the year, the heaviest shipments going to the Pacific Coast. This territory is also taking a large quantity of tin plate and sheets, especially galvanized. Scrap and coke are both soft, and prices are low.

Pig Iron.—Business in pig iron this week has been confined to small lots generally. The market is in an unsettled condition as a result of the hammerings it has received in the last few weeks by the large basic and malleable consumers. Despite the confident prognostications of sellers, prices seem dangerously inclined to weakness. Southern iron has sheared off a few points in the last week, and the $14 Birmingham schedule is the top price of the market. Furnaces with freight differentials of 25 cents to 45 cents a ton, make no hesitancy about sacrificing same in order to close a contract. The Pullman Co.'s order for 1,000 tons each of No. 2 and No. 3 foundry is said to have been taken at a price between $13.50 and $13.75 Birmingham for the No. 2, and equally as desirable business is reported to have been quoted at low prices. Ohio furnaces have shaded the northern market with the same freedom. One lot of 2,000 tons of malleable was sold on the basis of $15.80 furnace, which is equivalent to $18.10 Chicago. Since then, there has been an active buying of malleable and the market has stiffened at an advance of 20 cents a ton, or $18.30 Chicago. Foundry irons are quoted by these interests on the same basis, and the local market for No. 2 now ranges between $18.30 and $18.50 Chicago, the latter being asked by local stacks on ordinary sized lots. Statistically speaking, the market should be stronger; and arguing from the standpoint of unparalleled consumption and denuded stock piles, which are undoubted facts, local sellers look for a rapid advance as soon as the low-priced furnaces are filled up. In this connection it is important to note that the Tennessee company has transferred one Pioneer furnace and one of the "De Bardeleben" stacks from foundry to basic, because of the shortage of the latter grade of iron for rail making operations. This action means a curtailment of foundry irons from the south, which will be felt as soon as active demand sets in.

Lake Superior charcoal continues in good demand, and is without change as to price. We have revised our prices, and quote as follows:

Lake Superior charcoal	$19.00 to 19.25
Northern Foundry No. 1	18.80 to 19.05
Northern Foundry No. 2	18.30 to 18.55
Northern Foundry No. 3	17.80 to 18.05
Northern Scotch Foundry	18.80 to 19.05
Ohio Strong Softeners No. 1	19.80 to 20.05
Ohio Strong Softeners No. 2	19.30 to 19.55
Southern Foundry No. 1	18.25 to 18.40
Southern Foundry No. 2	17.65 to 17.90
Southern Foundry No. 3	17.15 to 17.40
Southern Foundry No. 4	16.65 to 16.90
Southern No. 1 Soft	18.25 to 18.40
Southern No. 2 Soft	17.65 to 17.90
Southern Gray Forge	16.15 to 16.40
Southern Mottled	15.90 to 16.15
Southern Silveries (4 percent to 6 percent Silicon)	18.15 to 18.65
Jackson Co. Silveries, 8 to 10 percent Silicon	23.30 to 24 30
Alabama and Georgia Car Wheel	22.65
Malleable Bessemer	18.30 to 18.75
Basic Iron	18.40 to 18.85

Merchant Steel.—Agricultural implement manufacturers and others continue to place contracts with mills for season requirements. The buying of the products quoted below has been very general since mill books were opened, and the greater part of the trade has already covered for its wants. Specifications are active. We quote mill shipments, Chicago delivery, as follows:

Spring steel, 2.10c; sleigh shoe, flat sizes, 1.71½c; concave and convex, 1.86½c; cutter shoe, 2.35c to 2.40c; smooth finished machinery steel, 1.91½c; smooth finished tire, 1.86½c base; plow steel, 2.20c and upward, according to quality; toe calk steel, 2.21c; railway spring, 1.86½c. Cold rolled shafting, 50 per cent off in carload lots and 45 per cent in less than carload lots. Crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and up.

Plates.—Universal plates are in active demand. Manufacturers have well filled order books, and it is practically impossible to get a delivery earlier than July on this material. Sheared plates are not so active, although the local mill manages to keep about 5,000 tons ahead of its daily shipments. The demand for light plates is strong, live specifications being in hand sufficient to tax the output of local plants for at least three months. Prices are without change, mill shipments, Chicago delivery, being quoted as follows:

Tank steel, ¼-inch and heavier, up to 100 inches wide, 1.76½c base; flange steel, 1.86½c base; marine steel, 1.96½c base; all full extras. Plates 3-16 inch thick, $2 extra; gauges 7 to 8, $3 extra; No. 9, $5 extra. Less than carload lots, $5 extra. We quote from local stocks; tank steel ¼ inch and heavier, up to 72 inches wide, 2c to 2.10c; 72 inches to 96 inches wide, 2.10c to 2.20c; 3-16 inch up to and including 60 inches wide, 2.10c to 2.20c; 3-16 inch 72 inches wide, 2.35c to 2.45c; No. 8, up to 60 inches wide, 2.15c to 2.25c; flange steel, 25c extra; heads, 25c extra.

Structural Steel.—Few transactions involving structural steel were closed last week. The structural iron workers who have been on strike, since shortly after May 1 returned to work last week on a compromise arrangement pending the settlement of their dispute by arbitration. All the local fabricating shops are now busy on jobs in progress before operations ceased. The Sixty-eighth street pumping station, calling for about 100 tons of steel has been let to the American Bridge Co. A large tonnage of material will soon come into the market for track elevation work in Chicago, negotiations to this end being near to the point of closing. Western railroads are also contemplating extensive renewals to their maintenance of way, the tonnage for which is expected to run into round figures. We quote carload lots, mill shipments, Chicago delivery, as follows:

Beams and channels, 3 to 15 inches, inclusive, 1.86½c; angles, 3 to 6 inches, 1.86½c; angles, larger than 6 inches, on one or both legs, 1.96½c; beams, larger than 15 inches, 1.96½c; zees, 3 inches and over, 1.86½c; tees, 3 inches and over, 1.91½c, with the usual extras for cutting to exact lengths, punching, coping, bending, or other shop work.

Quotations on lots from store are as follows: All angles three inches and larger, including six inches, $2.25 per 100 pounds base; angles over six inches, $2.35 per 100 pounds base; tees, three inches and larger, $2.30 per 100 pounds base; beams, three inches to fifteen inches, inclusive, $2.25 per 100 pounds base; beams, eighteen inches and larger, $2.35 per 100 pounds base; channels, three inches and larger, $2.25 per 100 pounds base.

Rails and Track Supplies.—Demand for rails for 1907 delivery continues very heavy. The Illinois Steel Co. has substantially half a million tons on its books for next year's shipment, which is practically three-quarters of its out-

put. Several large contracts are still under negotiation. During the week past, the Burlington has closed for 50,000 tons and the Illinois Central for 20,000 tons. Part of the latter was placed with the Tennessee company, but the entire Burlington order, it is said, went to the Corporation. Sales of track supplies for next year's delivery have not yet commenced. The tonnage in demand for 1906 shipment is large, especially for bolts and spikes, for which deliveries are hard to obtain.

We quote, standard sections, f. o. b. mill, open-hearth rails, $29; Bessemer, $28; light rails, Bessemer steel, 30 to 45-pound sections, $27 to $28, 25-pound, $28 to $29; 20-pound, $29 to $30; 16-pound, $30 to $31; 12-pound, $31 to $32, and light sections down to 8-pound, $38 to $40, all f. o. b. mill. Track supplies are quoted as follows: angle bars, 1.50c to 1.75c; spikes (for quick shipment), 2.15c to 2.25c; (for forward deliveries) 2.05c to 2.10c; track bolts, 2.65c to 2.75c. base square nuts.

Cast Iron Pipe.—The market is without any noteworthy features. Municipal inquiries are scarce, and from a tonnage standpoint the week's sales were light. Prices are without change as follows: 4-inch water pipe, $31, Chicago; 6, 8, 10 and 12-inch, $30; larger sizes, $29.50; gas pipe, $1 extra.

Merchant Pipe.—The local situation is in as good condition as can well be desired. Demand is strong and steady and prices are firm. We quote ¾ to 6-inch black steel pipe, 78.35 per cent discount from list, and galvanized 68.35 per cent discount. Minimum quotations of jobbers are 76½ to 77 per cent discount on the base sizes ¾ to 6-inch black steel pipe.

Boiler Tubes.—The market is still in a ragged condition. The leading producer is meeting the competition of other interests on such business as it desires to take, quoting in some instances the discounts given below. Demand is light. Local jobbers have not changed their schedule and report no difficulty in getting the prices quoted. The following quotations fairly represent current values, although they are at times deviated from slightly to meet special conditions:

	Steel	Iron	Seamless
1 to 1¼ inches	46.35	48.35	53.35
1¼ to 2¼ inches	58.35	43.35	40.35
2¼ inches	60.35	48.35	43.35
2¼ to 5 inches	68.35	55.35	
2¾ to 4½ inches (Seamless)			50.85
6 to 13 inches	58.35	43.35	

Less than carload lots, from store, as follows:

	Steel	Iron	Seamless Steel
1 to 1¼ inches inclusive	40	35	42½
1¼ to 2¼ inches, inclusive	50	35	35
2¼ inches, inclusive	52½	35	30
2¼ to 5 inches, inclusive	60	47½	42½

Wire Products.—Activity marks every branch of the wire market. Stocks in all parts of the country seem to be in urgent need of replenishment, judged by the insistent demand that keeps up. Mill men, jobbers and others in close touch with the agricultural situation say there never was such a demand for wire materials as exists now. The entire output of every plant goes into immediate consumption, but even this tonnage falls short of meeting the country's requirements. Large shipments continue to be made to the Pacific coast, especially of wire nails, smooth wire and materials to be used in street railway building. Prices are very firm, carload lots to jobbers, Chicago delivery, being quoted as follows:

Wire nails, $2; painted barbed wire $2.15; galvanized barbed wire, $2.45; smooth annealed wire, $1.85; smooth galvanized wire, $2.15; polished staples, $2.15; galvanized staples, $2.40. Carload lots to retailers, 5 cents higher than above prices; less than carload lots, 15 cents higher.

Coke.—The local coke market shows no special change. Demand is of an intermittent character and prices are inclined to softness. There is an abundance of spot coke offered, and a number of sales at very low prices have been forced by accumulating demurrage charges. Contracting for forward deliveries is light, the bulk of the local trade being covered for at least the next three months. Wise county brands are offered at $2.75 ovens, or $5 Chicago; Connellsville brands range from $5 to $5.25, and Solvay coke at $5.40 to $5.65 Chicago.

Billets and Rods.—The principal transaction of the week was a sale of 2,500 tons of re-rolling billets by a Pennsylvania mill to a Western consumer. Forging billets are in active demand. Local prices are stiff at a minimum of $35 Chicago. Wire rods are quoted from $35 to $36 Chicago.

Iron and Steel Bars.—Specifications for both products are active. Railroads are the principal consumers of iron bars, local mills being crowded with orders from this source, especially for the heavier sizes. Some new tonnage has been closed for deliveries extending throughout the entire year, and several fair sized contracts for the same delivery are pending. Demand for steel bars continues of a modest proportion. Prices are firm and without change, carload lots, Chicago delivery, being quoted as follows:

Bar iron, 1.66½c; soft steel bars and bands, 1.66½c half extras; soft steel angles, less than 3 x 3, 1.76½c; hoops, 2.06½c base, full extras; old rail stock, 1.65½c. There is a good movement from local warehouses and jobbers' prices are firm. We quote bar iron, 2.10c full extras; soft steel rounds and squares, 3 inches and larger, $2 per 100 pounds base; flats, 2 inches to 4 inches by 1⅛-inch and larger, $2 per 100 pounds base; flats, 2 inches to 4 inches by 1⅛-inch and larger, $2 per 100 pounds base; flats, 4½ inches x 5 inches and 6 inches x 5-16 inch and thicker, $2 per 100 pounds base; all ovals, half rounds, $2 per 100 pounds base; steel bands, $1.85 to $1.95 half extras; soft steel hoops, $2.30 to $2.40 full extras. Other sizes not mentioned above, $1.85 per 100 pounds base, plus half extras.

Sheets.—No abatement is noticed in the demand for either black or galvanized sheets. Specifications for both are coming in very freely, and mills everywhere are running to their fullest capacity. New tonnage is also of good proportions, consumers covering freely for their future wants. No trouble is experienced in obtaining full schedule prices, one or two mills being so crowded with orders as to feel the necessity of quoting above the market in order to escape the business. We quote mill shipments, Chicago delivery, as follows:

Nos. 8, 9 and 10, 1.86½c; Nos. 11 and 12, 1.91½c; Nos. 13 and 14, 1.96½c; Nos. 15 and 16, 2.06½c. Box annealed, Nos. 18 and 20, 2.26½c; Nos. 22 and 24, 2.36½c; No. 26, 2.41½c; No. 27, 2.46½c; No. 28, 2.56½c; No. 29, 2.71½c; No. 30, 2.81½c. Jobbers' prices on less than carload lots are as follows: No. 10, 2.20c; No. 12, 2.25c; No. 14, 2.30c; No. 16, 2.40c; Nos. 18 and 20, 2.55c; Nos. 22 and 24, 2.60c; No. 26, 2.65c; No. 27, 2.70c; No. 28, 2.75c; No. 30, 3.20c.

Quotations on galvanized sheets, carload lots, mill shipments, are as follows: Nos. 10 and 11, 2.46½c to 2.51½c; Nos. 17-21, 2.81½c to 2.86½c; Nos. 22-24, 2.96½c to 3.01½c; Nos. 25-26, 3.16½c to 3.21½c; No. 27, 3.36½c to 3.41½c; No. 28, 3.56½c to 3.61½c; No. 29, 3.81½c to 3.86½c; No. 30, 4.06½c to 4.11½c. From store, galvanized sheets, less than carload lots, are quoted as follows: No. 10 to 20, 3c to 3.10c; Nos. 22 and 24, 3.15c to 3.25c; No. 26, 3.35c to 3.45c; No. 27, 3.55c to 3.65c; No. 28, 3.75c to 3.85c; No. 30, 4.95c to 5c.

Old Material.—The market is slow to gather strength and some local dealers are selling short. The light demand from foundries due to the molders' strike and the general filled-up condition of open-hearth plants and bar iron mills, coupled with the heavy offerings of railroads, have served to weaken prices all along the line. Scrap is plentiful, buyers are scarce, and it usually requires an attractive price to bring out an order. We have revised

our quotations as follows, gross tons being given in the first paragraph:

Old Steel Rails (4 feet and over)	$16.00 to 16.50
Old Steel Rails (less than 4 feet)	14.50 to 15.00
Old Car Wheels	18.50 to 19.00
Old Iron Rails	21.00 to 21.50
Relaying Rails, subject to inspection	27.00 to 27.50
Heavy Melting Steel	13.50 to 14.00
Mixed Country Steel	11.50 to 12.00

We quote as follows net tons:

No. 1 R. R. Wrought	$15.00 to 15.25
No. 2 R. R. Wrought	14.00 to 14.25
Shafting	16.00 to 16.50
Dealers' Forge No. 1	12.75 to 13.25
Wrought Pipe and Flues	10.50 to 10.75
No. 1 Cast, 150 pounds and less	13.50 to 13.75
No. 1 Mill	9.50 to 9.75
Mixed Busheling (No. 1 & No. 2)	10.00 to 10.25
Country Sheet	8.00 to 8.50
No. 1 Boilers Cut	10.00 to 10.50
Boiler Punchings	12.00 to 12.50
Iron Car Axles	23.50 to 24.00
Steel Car Axles	18.50 to 19.00
Iron Axle Turnings	10.75 to 11.00
Cast Borings	8.50 to 9.00
Mixed Borings, etc.	8.50 to 9.00
Machine Shop Turnings	10.50 to 11.00
Ralroad Malleable	13.50 to 14.00
Agricultural Malleable	12.50 to 13.00
Stove Plate and Light Cast Scrap	10.50 to 11.00
Old Iron Splice Bars	16.50 to 17.00

CLEVELAND.

Ore Docks Busy Caring for Congested Business.—Pig Iron Active.

OFFICE OF *The Iron Trade Review*,
BROWNING BUILDING, May 15

Iron Ore.—With the collapse of the longshoremen's strike in behalf of the mates and the assurance that petty difficulties now pending in the labor field will be settled without delay, ore shipping has been resumed and every effort is being put forth to unload the freighters which are crowding docks and harbors of the lower lake ports. It is estimated that at the close of the strike almost 1,500,000 tons of ore were waiting to be unloaded at the docks. Night and day shifts are making great inroads into this tonnage, and by the end of the week the congested conditions will be relieved. It is not believed that the strike will seriously decrease the total tonnage of the season. Some small sales of ore are reported, all at full price. We quote on the basis of $4.25 Old Range Bessemer.

Pig Iron.—The demand is strong in all lines, and the past week has developed sales of large proportions with inquiries numerous and for good tonnages. Bessemer iron is exceedingly scarce, and it now appears that the make for the next three months is pretty well covered. There have been rumors during the week of basic selling slightly below $17, but these lack substantiation and the situation apparently is firm. Some large tonnages of malleable have recently been placed, and foundrymen are buying actively in view of the settlement of difficulties with the molders' union. Foundry prices, which declined sharply a few weeks ago, are stationary on the basis of $16.25 to $16.50 northern furnaces. Coke continues to feel the effect of the settlement in the anthracite strike and the market is not active as the large amounts stored in anticipation of a continued tie-up are now coming out. Prices are $2.40 to $2.60 for furnace coke, prompt delivery, and contract coke for the last half can be had for $2.75. We quote Cleveland delivery as follows:

Bessemer	$18.10 to 18.35
No. 1 Foundry	17.25 to 17.50
No. 2 Foundry	16.75
No. 3 Foundry	16.25 to 16.50
No. 2 Southern	17.85 to 18.10
Gray Forge	16.35 to 16.85
Gray Forge, Southern	15.85 to 16.35
Lake Superior charcoal	19.50 to 20.00

Finished Materials.—Sheets are the strongest feature of the market. Leading interests are several weeks behind in deliveries and independent makers are begining to ask premiums for quick delivery. An official advance in price is being talked of. Plates are selling rapidly and there is no evidence in this district of reported price cutting. Steel bars are exceedingly strong and some attractive business has been refused by large interests whose customers are taxing their output with specifications. Bar iron continues firm at $1.50 Pittsburg plus actual freight, and certain western interests are complaining that this arrangement is working a considerable hardship. The addition to the Empire Rolling Mill will be ready for operation within a short time. Structural materials are in fair demand with considerable business going to jobbers.

Old Materials.—The inactivity of early spring continues with little change, though dealers are buying in larger quantities, and in some instances are storing considerable scrap. Some railroad lists have come out during the week, that of the B. & O. being noteworthy. Prices have advanced slightly in a few instances, and we quote Cleveland delivery as follows:

Old iron rails	$21.00 to 22.00
Old steel rails (over 6 feet)	16.50 to 17.00
Old steel rails (under 6 feet)	16.50 to 17.50
Old car wheels	16.50 to 16.75
Steel boiler plate	12.00 to 13.00
Steel axles	19.00 to 20.00
Malleable iron (railroad)	15.00 to 15.50
Malleable iron (agricultural)	13.00 to 13.50
Heavy steel	14.85 to 15.25
Country mixed steel	13.00 to 13.50

We quote net tons, as follows:

No. 1 R. R. wrought	15.50 to 16.00
No. 1 busheling	12.00 to 12.50
No. 1 machine cast	13.25 to 13.70
Iron axles	22.00 to 23.00
Axle turnings	11.00 to 12.00
Wrought turnings (free from cast)	9.50 to 10.00
Grate bars	10.00 to 10.50
Pipes and flues	11.50 to 12.00
Tank iron	10.50 to 11.00
Hoop and band iron	7.50 to 8.00
Sheet iron	6.50 to 7.00
Wrought drillings	9.50 to 10.00
Stove plate	10.00 to 10.50
Cast borings	7.50 to 8.00

CINCINNATI.

Pig Iron Market Quiet, but Prices do not Change.—Coke is Easier.

May 15.

Pig Iron.—The past week has been quiet and there has been less business placed than in the preceding week. There has been but little inquiry and the dullness prevailing has given rise to an easier feeling in some quarters. So far as the quotation list is concerned there is no change in prices. In spite of the general quietness of the market, we note sales of 850 tons of southern foundry iron to an Indiana concern for delivery in the second half of the year at $14.00 Birmingham. A large melter in Michigan took 2,000 tons of foundry iron, part southern and part northern, for delivery in the next three months. On this sale the prices were not given out, but they were understood to be at the current level of quotations. Some fairly good sales of basic iron have been made also, but the rank and file of buyers have been showing no interest in the situation.

So far as we can learn there is no quotable change in the market, but there have been rumors of some shading of prices in the Hanging Rock district and there is also some little southern iron to be had at $13.50 Birmingham, but not enough to affect the market. So far as the southern furnaces are concerned there is an increasing disposition to join with the Birmingham furnaces in maintaining the $14.00 basis, by the other furnaces located outside of the Birmingham district. In the north, the southern Ohio pig iron makers are firmly holding the $16.00 price for No. 2 foundry and one furnace company has advanced its quotation to $16.50 at furnace. We quote f. o. b. Cincinnati as follows:

Southern Foundry No. 1	$17.25 to 17.50
Southern Foundry No. 2	16.75 to 17.00
Southern Foundry No. 3	16.25 to 16.50
Southern Foundry No. 4	15.75 to 16.00
Southern Foundry No. 1, soft	17.25 to 17.50
Southern Foundry No. 2, soft	16.75 to 17.00
Gray Forge	14.75 to 15.00
Northern Foundry No. 1	17.65 to 18.15
Northern Foundry No. 2	17.15 to 17.65
Northern Foundry No. 3	16.65 to 17.15
Jackson County Silvery, 8 per cent	21.15 to 21.65
Southern Charcoal	22.75 to 23.25

Finished Material.—The jobbing demand continues active and the market rules firm at quotations for most descriptions. Bar iron is irregular but the Pittsburg basis is regarded as the market here.

We quote: bars at 1.63c, half extras, with dealers quoting 1.85c for iron and steel out of store. Galvanized sheets, No. 10 and No. 12, in car lots are 2.58c. We quote black sheets, No. 27 at 2.40c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.85c; No. 27, 2.75c; No. 16, 2.35c; No. 14, 2.25c; No. 12, 2.15c. Tank plates are firm and sell out of store at 2c to 2.10c for ¼-inch and 2.10c for 3-16, Nos. 8 and 10. Beams and channels are quoted at 2.25c to 2.35c from stock and angles at 2.10c to 2.15c for base sizes.

In merchant pipe the market is fairly active and there is a firmer undertone

prevailing. There seems to be a disposition to maintain prices a little more steadily but there is no quotable change in the market. We quote f. o. b. Cincinnati:

MERCHANT PIPE.
(Basing Discounts)

	Steel Pipe		Guaranteed Wrought Iron Pipe	
	Black Per cent	Galv. Per cent	Black Per cent	Galv. Per cent
⅛ and ¼ inches	69.7	53.7	....	....
⅜ inch	73.5	61.3	....	....
½ inch	73.7	61.7	....	....
¾ to 6 inches	77.7	67.7	....	....
7 to 12 inches	72.7	57.7	....	....

Coke.—The market is easier for foundry coke and trade is quiet. There is a slight reduction in quotations. Furnace coke is dull and there is nothing doing in the way of contracting. Prices in the leading coke producing centers are as follows:

Wise County, Va. Furnace Coke prompt shipment	$2.50 per ton
Wise County, Va. Foundry Coke prompt shipment	3.00 to 3.25 per ton
Pocahontas Furnace Coke prompt shipment	$2.25 to 2.50 per ton
Pocahontas Foundry Coke on contracts	2.75 to 3.00 per ton
Connellsville Furnace Coke prompt shipment	2.50 per ton
Connellsville Foundry Coke prompt shipment	3.00 to 3.25 per ton
New River Foundry Coke on contracts or prompt shipment	3.00 to 3.25 per ton
New River Furnace Coke, prompt shipment	2.50 per ton

†Wise County, Va., Coke on Furnace contracts is sold mainly on a sliding scale basis for pig iron prices on the following basis: $1.65 per ton on $9.00 pig iron, plus 17 per cent of the advance on pig iron above $9.00 Birmingham

Old Material.—The market is quiet with an easy tone prevailing. There is no quotable change in prices. We quote f. o. b. Cincinnati:

Old No. 1 railroad wrought, net tons	$14.00 to 14.50
Cast machine and foundry, net tons	12.50 to 13.00
Old iron rails, gross tons	20.00 to 20.50
Old steel rails, gross tons	15.50 to 16.00
Old short lengths, gross tons	16.00 to 17.00
Old iron axles, net tons	22.00 to 23.00
Stove plate, net tons	10.00 to 10.50
Wrought turnings, net tons	9.50 to 10.00
Cast borings, net tons	7.00 to 7.50
Car wheels, net tons	16.00 to 16.50

NEW YORK.

A Quiet Week in Pig Iron Market.—Bookings of Rails for 1907 Delivery Early and Heavy.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., May 14.

Pig Iron.—It has been a quiet week in the pig iron market, even routine business to regular customers being small in volume. The disappearance of the anthracite coal strike as a factor seems to have encouraged consumers to hold off for better terms. Although the steady movement of supplies has not ceased yet as far as the large block business is concerned, it has again settled down to a waiting market. The large tonnages for which inquiries were out last week have been held up indefinitely. Consumption maintains its unprecedented rate and producers are confident that with increased cost of materials prices will at least hold their own, but purchasers are apparently as firmly of the opinion that if quotations do not sag in the near future they will not go higher. Of the sales of basic reported during the week about 10,000 tons are accounted for in the local market, a lot for eastern Pennsylvania consumption. Actual sales of foundry iron have been almost entirely confined to lots of 100 tons and less for nearby shipment. Of these only a very few were supplied by Alabama furnaces at the stubbornly held price of $14 Birmingham. Regular customers using favorite brands are the only buyers who consent to this figure, and in every case in which competition is free representatives of the chief southern producers are unable to meet the delivered prices of New York state, New Jersey and Pennsylvania furnaces. This morning the volume of inquiry was fair for foundry grades. Bids were requested on three 500-ton lots for second quarter shipment, on 350 tons of special iron and from 2,000 to 3,000 tons of basic. There are also inquiries for two 10,000-ton lots of basic, but the intentions of the inquirer may not be very serious. Nothing of note seems to have been done in either gray forge or malleable. Interest in ferro-manganese has fallen off during the past few weeks and at present transactions are almost nil. The following are prices of pig iron at tidewater:

Northern No. 1 Foundry	$18.25 to 19.00
No. 2 Foundry	17.75 to 18.50
No. 2 Plain	17.50 to 18.00
No. 1 Southern Foundry	18.00 to 18.50
No. 2 Southern Foundry	17.50 to 18.00
No. 3 Southern Foundry	16.75 to 17.25
No. 4 Foundry	16.50 to 17.00

Certificates and Warrants.—The market continues dull and there has been little or no change. Sales were small. The following are today's quotations for standard contracts:

Standard Foundry Contracts.

	Bid.	Asked.
May	17.25	17.75
June	17.25	17.55
July	17.25	17.90
October	17.00	17.50

Finished Iron and Steel.—Although details are not as yet available it is reported that fully 1,000,000 tons of rails for 1907 have already been under negotiation. Of these more than 500,000 tons have resulted in contracts and orders for 600,000 more are pending. The Pacific roads are expected to take 300,000 tons, and several orders have been closed during the past few days. Among these are Nickel Plate, 5,500; Wisconsin Central, 5,000 tons; and Chicago, Great Western, 2,200. The Baton Rouge & Eastern has purchased 6,200 tons for delivery during the present year. Other purchases are noted elsewhere in the present issue. Business in structural and bridge material has been large in the aggregate although individual lots have been small. The American Bridge Co. secured contracts for a cement plant in Kansas requiring 1,200 tons of steel, and the Racquet Club building in Philadelphia. The Franklin & Clearfield division of the Lake Shore placed an order for 2,700 tons of bridge material with the King Bridge Co., and the Baltimore & Ohio one for 2,000 tons with the McClintic-Marshall Construction Co. A considerable tonnage of railroad bridge work is still pending. New plate business has been of a routine nature but very satisfactory in volume. Bar iron has been quiet but steady.

The following are prices at tidewater: Angles, 3 to 6 inches x ¼ inch and heavier, 1.84½c; beams, 3 to 15 inches, 1.84¼c; tees, 3 x ¼ inch and heavier, 1.89½c; plates, carloads, tank, 1.74½c; flange, 1.84¼c; marine boiler, 2.41½c; refined iron bars, 1.64½c to 1.74½c; soft steel bars, 1.64½c; sheets, No. 28 black, 2.40c.

Old Materials.—The market has weakened perceptibly during the past few days, but prices are practically unchanged. Shipments have been comparatively heavy and stocks have in consequence been reduced. The varieties of scrap in best demand are heavy melting steel and relaying rails. Of the former, sales aggregating 2,000 tons are reported. Of strictly scrap rails about 500 tons were sold and of rerolling rails 750 tons. Several sales of heavy cast scrap are reported, mostly of less than 100 tons each. Two lots of wrought yard scrap amounting in all to 800 tons were disposed of and there are inquiries in the market for more. There are several inquiries in the market for relaying rails which appear to be in good demand. The following are prices approximately f. o. b. tidewater:

Old iron rails	$21.00 to 22.00
Old steel rails, long lengths	15.00 to 15.50
Old steel rails, short pieces	14.50 to 14.75
Relaying rails	24.00 to 25.00
Old car wheels	17.00 to 18.00
Old iron car axles	26.00 to 27.00
Old steel car axles	19.00 to 19.50
Heavy melting steel scrap	15.00 to 15.50
No. 1 railroad wrought scrap	18.00 to 19.00
Iron track scrap	17.00 to 17.50
Wrought pipe	12.50 to 13.50
Cast borings	10.00 to 10.50
Wrought turnings	13.50 to 14.00

PHILADELPHIA.

Continued Activity Throughout the Year is Expected.

May 15.

Pig Iron.—With the clearing up of the labor troubles of the miners and longshoremen the market has taken on a more cheerful tone, as uninterrupted activity is now confidently looked for during the rest of the year. Consumers are known to be pretty nearly bare of stocks, and large orders

are looked for in the near future. There is fair activity in orders for the last half of the year, and as the situation steadily clears these are bound to become more numerous. Among the large orders recently placed is one of 10,000 tons of basic iron by a New Jersey producer for a Philadelphia industry, at $17.50 a ton. This is below the price generally current, which is $17.75. Foundry irons are a little quiet, but strong. The feeling among the furnacemen is one of quiet confidence, with no disposition to let prices sag. These remain practically unchanged, as follows:

No 1X Foundry	$19.25 to 19.50
No. 2X Foundry	18.50 to 19.00
No. 2 Plain	18.25 to 18.50
Standard Gray Forge	16.50 to 16.75
Basic	17.50 to 17.90
Low Phosphorus	25.00 to 25.50
Southern No. 2X rail	18.75 to 19.00

New Material.—The Pennsylvania railroad's steel rail order for 1907, 180,930 tons, which it is expected will be supplemented by smaller amounts later on, has had a good effect in indicating that the heavy railroad buying, which has been such a marked feature for the past ten years, is to be continued. Structural material and plates continue most in demand, and the bar trade is looking up. Prices remain unchanged, as follows: Beams, channels and angles according to specifications, 1.83½c; refined iron bars, 1.63½c to 1.73½c; steel bars, 1.63½c to 1.73½c; plates, 1.73½c to 1.83½c.

Old Material.—Almost without warning the market weakened last week under the combined effects of some pressing selling orders, railroad embargoes on large consumers, and small demand from the mills, and it has remained somewhat depressed ever since. The lowering of prices resulted in no great buying activity, so that bottom does not seem to have been reached. Prices may be quoted as follows:

Old steel rails	$16.50 to 16.75
No. 1 steel scrap	16.50 to 16.75
Old steel axles	20.00 to 21.00
Old iron axles	25.00 to 26.00
Old iron rails	21.00 to 21.50
Old car wheels	16.00 to 16.75
Choice scrap, R. R. No. 1 wrought	19.00 to 20.00
No. 1 yard scrap	17.00 to 18.00
Machinery scrap	15.50 to 16.00
Low phosphorus scrap	20.00 to 20.50
Wrought iron pipe	14.50 to 15.00
No. 1 forge fire scrap	15.00 to 15.50
No. 2 forge fire scrap, ordinary	10.00 to 10.50
Wrought turnings	13.00 to 13.50
Axle turnings, heavy	13.75 to 14.50
Cast borings	9.75 to 10.25
Stove plates	11.50 to 12.50

BIRMINGHAM.

Great Activity in Alabama.—Steel Plants are Working Steadily.

May 14.

Alabama iron manufacturers state that while there is no extraordinary demand being received now, there is a steady inquiry and the prospects are very bright. The production in this district has not been improved any of late. The Sloss-Sheffield Steel & Iron Co. had a little trouble at its No. 4 furnace this morning, iron breaking through the hearth. The damage will cause a hesitation in the iron production at North Birmingham for a while. The city furnace of this company, which has been undergoing repairs for several weeks, will hardly be ready for the torch before the end of this month. There is no change in iron quotations. No. 2 foundry iron is still being held at $14.00 per ton with a little scarcity noted on spot delivery. The shipments from the district are far from being as large as they were a few months ago. The home consumption is very heavy. A visit to some of the furnaces in the immediate district in the last few days revealed the yards pretty bare of iron. What iron was seen stacked up was reported as having been sold some time since. Cars are being loaded steadily. The shipment from the district and the home consumption are greater than the production, which means that accumulated stock is being worked off by degrees.

There is no end to the home consumption of iron in this district. Cast iron pipe works, and other industries employing iron in their daily operation are working on full time and are using great quantities of iron.

The steel plants at Gadsden and Ensley are both working steadily and there is demand for every ton of their product. E. T. Schuler, president of the Southern Steel Co., has announced that arrangements have been made for the erection near the Gadsden steel plant, works for the construction of steel cars. This plant will also make structural steel for buildings and for bridges, in fact steel plates and beams of all kinds such as are usually turned out from what is known as a universal mill. A rod, wire nail and field fence mill will also be erected at Gadsden. Orders have been let for the machinery and just as soon as it is received it will be installed. An additional open-hearth furnace at the steel plant is under way now. Twenty-five hundred more men will be given employment at the new industries in Gadsden.

J. W. Shook has been elected general manager of the Central Coal & Iron Co., and he leaves the Ensley furnaces to accept his new duties on June 1. The Central company has a furnace in operation at Holt, in Tuskaloosa county.

John A. Topping, president of the Republic Iron & Steel Co. and chairman of the board of directors of the Tennessee Coal, Iron & Railroad Co., has been in Birmingham for several days and has been visiting the various iron and steel plants of the two companies. It is not denied that he is now planning out the concentration of the two corporations. He has stated that he will be in a position shortly to make known changes in this district. There are many rumors in advance of this statement, including the erection of two furnaces at Ensley, the erection of four more open-hearth furnaces at the steel mill and other work. Steps have been taken already looking to the increasing of the output at the coal mines and opening of two new coal mines. Coal washers are being repaired and enlarged. All indications are that preparations are being made looking to a better production all around for a larger finished output.

ST. LOUIS.

Strike has Depressing Effect.—Strong Market for Shapes.

May 14.

The iron molders' strike continues to be a depressing factor in the local market for pig iron. While the men are still out in seven of the Belleville foundries and in several of the Kansas City plants, the chances for a settlement seem to be somewhat brighter, but now reports come from Atchison and Topeka, Kan., telling of troubles at those places. As in other sections the demands seem to be based more on a recognition of the union than for shorter hours or higher wages. There will be a meeting between the strikers and foundrymen at Belleville tomorrow. A report was current that the foundrymen had determined to concede the demands for shorter hours and probably peace would be declared. In Belleville the principal trouble is with the helpers. The molders are inclined to return to work and let the helpers fight their own battle.

While this contention is going on the iron market grows more quiet. Inquiries fell off perceptibly last week. There is some southern iron moving, but it is in small lots with the price hovering around the bottom notch. For foundry No. 2, $13.75 was the prevailing price. There were vague reports that some analysis iron had been sold even lower than this, but it is hard to grade this iron and so the sale really doesn't represent the market. The Republic-Tennessee and Sloss-Sheffield people declare they have positive orders not to quote below the $14 minimum agreed upon a few weeks ago, but there are enough interests outside this combination to supply more than the markets want now. Apparently the demand by the steel interests is all that keeps iron prices up.

The best sale of the week was 5,000 tons of basic sold by Decamp Bros. & Yule to the Commonwealth Steel

Foundry. There was another inquiry for 5,000 tons, but this has gone over for a few weeks. Melters feel that summer is coming with its usual period of quietude and they can buy to better advantage.

Coke remains comparatively quiet. One house reports orders for eighteen cars this morning. Prices run from $2.40 to $3.25 depending upon the grade.

Iron quotations, including the freight rate of $3.50 to East St. Louis, range as follows:

Southern No. 1	$17.75 to 18.25
Southern No. 2	17.25 to 17.75
Southern No. 3	16.75 to 17.25
Southern No. 4	16.50 to 17.00
Gray Forge	16.25 to 16.75

Finished Material.—Activity continues unabated for nearly all lines of finished products, especially structural shapes. Orders for nails, bolts, spikes, etc., are far above the supply. One of the principal houses reports that it has been turning down orders for spikes for two months. The largest deal for structural material is for the steel, 4,500 tons, for the Income Leaseholders' building, Fourth street, Pine to Chestnut, which has practically been closed with the Jones & Laughlin Steel Co. All that remains to be done is to sign the papers. Christopher & Simpson have been awarded the contract for the steel for Shaughnessy building at Twenty-second street and Washington avenue, which will require 500 tons.

Metal Market

NEW YORK.

May 15.

The week has been one of excitement and soaring prices. Tin quotations have left former figures so far behind that experienced traders are looking about for familiar landmarks. No plausible reason can be found for the extraordinary advances of the past week. London quotations are 80 pounds higher than the prices of a year ago, and the conditions which would force an advance are of comparatively slight importance. Antimony has if anything surpassed tin in eccentricity. Prices are now double those of only a few months ago.

Pig Tin.—The phenomenal markets of the past few weeks have resulted in a wild stampede, London traders leading. At the close prices were nominal.

The following are today's quotations: Spot, 48 to 49; May, 47 to 48; June, 46 to 47; London, £215 and £203; arrivals for the month to date, 1,057 tons; afloat, 1,835 tons.

Copper.—Domestic trading has been inconsiderable but exports abroad have increased. Today's quotations follow: Lake, 18¾ to 18⅞; electrolytic, 18⅜ to 18⅝; casting, 18¼ to 18⅜; London's closing today: £86 10s and £85 10s. Exports for the month to date, 7,993.

Lead.—Refined lead has been strong and higher. Today's closings, 5.85 to 5.95; St. Louis, 5.85; London, £16 17s 6d.

Spelter.—The market is quiet and easy. Today's closings, 5.95 to 6.05; St. Louis, 5.90, sellers; London, £26 12s 6d.

Antimony.—The market has been excited and prices range higher. Today's quotations, Cookson's and Hallett's, 25 to 26; other grades, 24½ to 25½.

ST. LOUIS.

May 14.

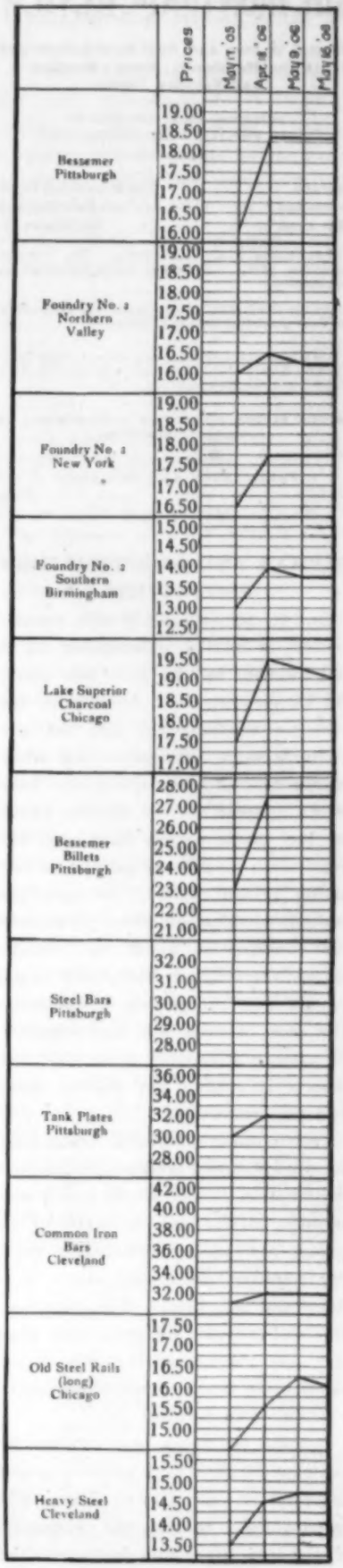
The lead market is exceedingly strong, the metal being scarcer than ever, and, of course, readily saleable at $5.85, an advance of 15 cents over last week's quotation, but producers of Missouri brands refuse to consider any bid under $6, now that the trust has raised its price 15 cents per hundred—equal to $5.77½ for corroding and $5.67½ for desilverized at this point.

Despite the persistent efforts of buyers in both Joplin and Galena fields to hammer down the price of zinc ore, it remains unchanged. There is a strong demand for ore, but in the face of this spelter continues dull. Today's quotation of $5.90 is nominal and shows a decline of 2½ cents from last week.

The Cambria Forge Co., Johnstown, Pa., has been incorporated for $150,000 by John H. Walter, R. P. Smith and Curtis G. Campbell. A plant has been completed at Johnstown where raw materials for forgings will be readily procurable and operations will begin about Aug. 1. Equipment has been purchased from the Hussey Drop Forging & Mfg. Co., Cleveland, which will be moved to Johnstown. The officials of the new plant will be W. Milt Brown, president; R. P. Smith, vice president; C. G. Campbell, secretary and treasurer, and P. Hussey, general manager.

Incorporations in the eastern states for the first four months of the current year represent an aggregate capitalization of $952,049,000, against $587,606,111 and $271,008,200 for the corresponding periods of 1905 and 1904. These figures are compiled by the *Journal of Commerce* and are exclusive of companies having a capitalization of less than $1,000,000 and of western companies, which would raise the total probably one-third.

PRICE CHART.



THE IRON TRADE REVIEW

Devoted to Iron and Steel Manufacture and to the Machinery, Metal-Working and Foundry Trades.

PUBLISHED EVERY THURSDAY BY
THE PENTON PUBLISHING CO.
CLEVELAND

CHICAGO - - 1164 Monadnock Block
PITTSBURG - - - 521 Park Building
NEW YORK - - - 150 Nassau St.

Subscription, $3.00 per annum. To Foreign Countries, $4.50. Advertising Rates Furnished on Application.

Change of advertising copy must reach this office ten days preceding date of publication.

The Cleveland News Co., will supply THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, AS SECOND CLASS MATTER

PRINTED IN AN OPEN SHOP

May 17, 1906

GERMAN AND AMERICAN IRON PRODUCTION.

Dr. P. Schwabach, British consul-general at Berlin, is authority for a table giving, for the past five years, the German pig iron production, the domestic consumption, and the per capita of each. It appears that while production and consumption have both grown a great deal in the five years, the per capita figures have also become much larger, the population not having grown rapidly. In 1901 per capita production was about 307 pounds and consumption about 199 pounds. In 1905 these figures had grown to 400 pounds and 263 pounds respectively. The gain in each was approximately the same, a trifle over 30 per cent, the exports increasing but slightly more than the production.

This is doing quite well, seeing that the per capita pig iron production and consumption of the whole world was in 1905 in the neighborhood of 80 pounds per capita. The three great iron countries, the United States, Germany and the United Kingdom, produce and consume the great bulk, however, the average of the rest of the world being but a comparatively small fraction of 80 pounds.

Despite the large gain shown by Germany in per capita production and consumption, the United States still keeps ahead. In 1901 the production of pig iron per capita in the United States was about 457 pounds, and domestic consumption about 435 pounds. In 1905 the production was about 620 pounds and the consumption about 575 pounds. Consumption increased a trifle more than 30 per cent, as it did 35 per cent, showing a greater gain than Germany. The gain in total production was, of course, much greater, as our population is increasing much more rapidly.

Details are lacking as to how the figures for Germany were made up. Those given here for the United States take account of all imports and exports, having regard not to their own weight but to the weight of the pig iron required to make them.

SOUND PRINCIPLES.

A strong plea for integrity, reciprocity and fraternity was made at the recent annual banquet of the Traffic Club of Pittsburg, by Vice President Caldwell, of the Delaware, Lackawanna & Western Railway Co. Mr. Caldwell pointed out the fact too often forgotten in the business world that history has demonstrated one thing beyond question as applied to business relations, and that is that an elevated morality defining the distinction between right and wrong, between honesty and dishonesty, must be the basis of all permanent progress, individual or national. "Irregular methods," he said, "are always demoralizing to those who practice them as well as to the interests they represent. Any traffic man, in fact, any business man, knows that it is easier to buy business than to secure it by the legitimate methods of intelligent and industrious effort; hence, such methods naturally present themselves as the easiest way of securing traffic, although the most expensive. It is only ignorance and indifference that believe in the theory that the easiest way is the best. Ease has no part in the strenuous life; it makes no contribution to progress. It may follow in beaten tracks, but never marks the way to new and untried fields of activity or of usefulness." In other words, the truth which Mr. Caldwell desires to drive home is that business obtained by bribery cannot be a solid foundation for more business. If goods are sold with the hope of obtaining further orders it must be because on account of their merit, and corruption in business can result only in feelings of contempt for each other on the part of the bribe giver and the bribe taker.

Mr. Caldwell also dealt upon the growing respect for the law and for obtaining business strictly in accordance with the law which forbids rebates and all kinds of unfair dealing. The railroads have suffered much on account of the attacks often well founded which have been made upon them but they are no more guilty than those who have been associated with them in transactions now prohibited by law. The passage of laws may accomplish much, but the cultivation of sound public sentiment by such organizations as the Traffic Club, and by such men as Mr. Caldwell cannot help but be of very great value. He not only spoke for honesty in business, but took high ground in advocating reciprocal and fraternal relations. With the cultivation and carrying out of such principles as he advocated the agitation which now threatens to be disastrous to railroad and other interests will quickly disappear.

A TRAVESTY ON FAIR DEALING.

A striking instance of the extent to which a popular hue and cry based on high-sounding but false and misleading arguments can influence legislation and work a dire hardship to a legitimate, long established industry is furnished by the progress which has been made by the Payne bill or "free alcohol" bill. This measure has passed the national house of representatives and is now pending in the senate. It provides for the exemption from internal revenue tax of denatured distilled spirits for industrial purposes. Its success so far has been entirely due to a deliberate misstatement of its real beneficiaries and of its probable effects.

It has been repeatedly stated that its passage would bring untaxed alcohol into direct competition with petroleum for light, heat and power purposes and hence would be a "blow at Standard Oil." Manufacturing interests during the hearings of the past week have shown the falsity of these statements. The cheapness of natural petroleum and its abundant supply as contrasted with the cost of manufacturing alco-

hol under the most favorable circumstances, even with the government paying a virtual subsidy of perhaps five cents per gallon for denaturing and excise supervision, render it impossible for competition ever to enter in. Standard Oil is not concerned with the measure, for it knows from the experience of other nations that its effects would never be felt. On the other hand, however, the measure, if passed, would have the direct and immediate effect of crippling and destroying the market for wood alcohol in which more than one hundred plants in the timber states have built up an extensive and legitimate industry, turning it out as a by-product in connection with the manufacture of charcoal for use in the smelting of iron ore. The bill, if it became a law, would greatly enhance the cost of charcoal and iron production and would inflict irreparable loss both to these allied industries and to the labor in their employ. Timber lands would suffer a corresponding decline in value and in a number of other directions the effect would be as injurious as it would be unjust. The only benefits would accrue to the distilling industry which originated the measure and has worked tirelessly for its passage. If the bill becomes a law it will be only an evidence that industrial legislation in the interest of a grasping lobby to the ruin of an established industry can be secured through foul means and that our national law-makers do not discriminate between fair, honest arguments and trumped-up, fictitious claims which have only selfish motives as their basis and are a travesty on truth and fair dealing.

THE BOOM IN METALS.

The present boom in tin, lead and antimony will be remembered in the trade beyond the present generation. Tin and antimony have this week reached by far the highest prices on record, while lead and copper are at the present time not far from making records.

In the amount of the proportionate advance, antimony has easily taken the lead. At the time of this writing Cookson's antimony in ordinary lots is held at 26½ cents. A year ago it sold at 9 cents, so that in one year this metal has practically tripled in value. No price like the present has ever been attained before.

The present price of tin is the highest on record. Taking London prices, as the London statistics can be carried further back, tin closed Monday of this week in London at £215 for spot. Statistics beginning with 1850 show the following swings:

1850,	low	£70
1857,	high	150
1866,	low	75
1872,	high	160
1878,	low	*52½
1882,	high	114
1884,	low	73
1888,	high	†170
1896,	low	56
1906,	high	215

* Lowest in history.
† Secretan syndicate.

The memory of the famous Secretan syndicate, which collapsed in January, 1888, is still fresh in the minds of the older metal men. Until now it has marked the highest price ever reached for pig tin. M. Secretan and his associates endeavored to corner copper and tin. The copper corner burst first and tin necessarily followed. M. Secretan blew his brains out. A large increase in the visible supply of tin occurred as the corner progressed, the invisible supply being converted into visible. A year afterwards the visible supply had become perfectly normal. What manipulation is connected with the present advance is of a totally different character. There is no cut and dried effort at a corner. Late last year the leading operators began pulling strictly together, but last March one of the largest operators was found to be heavily short for April, and a squeeze resulted. Where it will end no one can say.

There is, of course, scarcely any market for tin at the moment, and it will require a continuance of present prices for a little while before the manufacturing industries actually find themselves using such high priced tin. The time will unquestionably come, however, as it is certain that there will be no collapse. Tin will either advance further, or will decline but gradually.

The present movement in tin is a continuance of one which began in June, 1904, when tin almost touched 36 cents in New York. Following the boom of 1899-1900, when 33 cents was almost reached, there had been numerous fluctuations, all between 23 and 30 cents.

As the consuming trade does not deal with record prices but with averages, the following table of average monthly prices for the past 13 months is given, the averages being those of the daily closing prices for spot Straits tin, 5-ton lots and over:

April, 1905	30.62
May	30.16
June	30.41
July	31.78
August	32.97
September	32.16
October	32.55
November	33.50
December, 1905	35.85
January, 1906	36.49
February	36.48
March	36.64
April, 1906	38.90
May 14, 1906	49.50

The advance will fall very heavily on the tin plate manufacturers. In August last the minimum net price of tin plate was $3.25, with tin under 33 cents. The present official price is but 30 cents higher, yet the advance in tin is 16½c, equal to more than 35 cents per box of tin plate. All three of the advances in tin plate to the present found full justification in the advance in steel; there was nothing left with which to pay for higher tin.

Copper has not reached the high point of last December, when 20 cents was touched, but it is now within a cent or so of that figure. The sensational advance to a trifle over 18½ cents, in 1899, is left in the shade.

Consumers of iron and steel products must view with much satisfaction the steady market which has prevailed in these lines. It is well recognized that prices have been kept so steady largely by the efforts of leading interests in the trade, and with the example of these metals in view no one will grudge to place credit where it is due.

Bar Iron Scale.—The bi-monthly settlement of the bar iron scale was made in the offices of the Republic Iron & Steel Co., Pittsburg, May 11. The settlement was made on the 1.6 card which makes the puddling scale $6, as it has been during the past two months.

The Wellman-Seaver-Morgan Company's Pacific coast office formerly at San Francisco, is now temporarily located at 220 Twelfth St., Oakland, Cal.

PROGRESS OF THE MOLDERS' STRIKE.

The situation in a general way among the foundries of the country which are on a strike has not materially changed. At a meeting held in the city of Detroit on Saturday, May 5, a resolution signed by W. H. Winslow, Winslow Bros. & Co., Chicago, S. L. G. Knox, Bucyrus Co., So. Milwaukee, J. H. Schwacke, Wm. Sellers & Co., Inc., Philadelphia, and Antonio C. Pessano, Great Lakes Engineering Works, Detroit, was presented and adopted, urging that as quickly as possible a convention of the members of the whole association should be called to give further consideration to the entire question and determine a course of action to be pursued by the members of the association as a body. In accordance with this resolution a call for a convention was immediately issued and a letter written to every foundry, under the signature of the president of the association, urging that they join a meeting which would convene in the city of Chicago on Saturday, May 12, at the Auditorium hotel. In addition a number of letters and circulars were sent to the members of the association appraising them fully of the situation as it existed in different sections of the country. The true inwardness of the entire difficulty from the standpoint of the National Founders' Association is fully explained in a letter under the signature of the president of the association, from which we take the following extract:

"After considering this question for several days the union officials decided upon very drastic tactics, namely, to place a large number of men on the street in other large foundry centers with the idea that by so doing they would scatter the molders employed by the struck foundries in Philadelphia to such an extent that the Philadelphia foundrymen would capitulate. This idea was greatly intensified by the fact that machinery molders all over the country, whether union or non-union, are extremely scarce. In order to bring this condition about they very adroitly conceived the idea of demanding a strict union agreement of all the foundry men of the country. They reasoned that many people would sign this agreement rather than have a strike, in which event they would have succeeded in establishing a strict closed shop condition. On the other hand they knew full well many large localities would resist this demand and in such towns they would throw a large number of men on the streets; so that if their plans carried they would have won in every locality involved. This demand is made indiscriminately; members and non-members. They have also placed a large number of stove plate molders on the street."

That the controversy is likely to be long drawn out and mark an epoch in the history of these two great organizations is evident from the widely divergent views of the two organizations and the stand that has been taken by the leaders of each. In an authorized interview given to one of the Detroit papers, an officer of the association makes the following statement:

"It means a fight to a finish. There were about 100 of the employers present and it was stated that the vote was absolutely unanimous to refuse the request of the men for a union agreement. The whole question at issue is that of recognizing the union by signing an agreement. There was not a dissenting speech made or a dissenting vote cast on that proposition. There is no question of wages involved, nor anything but the one question of signing an agreement."

That there is a widespread feeling of restlessness on the part of members of the union, the great portion of whom seem to be participating in the desire to secure an increased wage rate, is shown by the report of the officers of the union to the members, in which they explain that at a recent meeting of the executive board they had 121 requests for financial support from that number of local unions in different sections of the country, all of whom were anxious to better their condition and desired the aid of their national body. With the exception of a few large centers where the present strikes have occurred, all of these were turned down, the union's officers declaring that they desired to pursue a more conservative course rather than involve all the country in conflict.

The Chicago Convention.

The special convention of the National Founders' Association held at Auditorium Hotel, Chicago, Saturday, May 12, was one of the most enthusiastic and best attended meetings held by that association. Though the announcements for the convention were issued but five days in advance of the date set the response was immediate and beyond the expectations of the officers. Nearly 200 members were present, all sections of the country, even Canada, being represented in the attendance. The meeting was called to secure from the membership a general discussion of the demands of the Iron Molders' Union for a closed shop and written agreements, as well as the manner and quality of support to be given those members whose shops had been struck for refusing to grant these conditions. Comment on the situation was outspoken and freely indulged in at both sessions, enthusiasm was general, and absolute unanimity of opinion prevailed as to the necessity of defending affected localities and assisting members in securing reasonable conditions in their foundries. Especially did the association determine to protect the independent workmen, whose loyalty in the past had been freely given them. To these ends, the entire resources of the association were pledged. There was not one present who counselled surrender or compromise, and the resolutions put were adopted without a dissenting vote.

Some perturbation has been created in the minds of the officers of the National Founders' Association by erroneous reports printed in the daily press that the purpose of this meeting was to engage in the disruption of the union. President Briggs denies this absolutely. He says the association has never advocated or been committed to a policy of extermination. The constitution and by-laws of the N. F. A. have placed the association squarely on record as favoring arbitration whenever and whereever possible on all questions such as wages and hours, a declaration or spirit which has not been shown on any occasion by union officials. For six years, the N. F. A., through committees composed of the best known men among manufacturers in the metal working lines, has endeavored honestly and sincerely to secure an agreement with the Iron Molders' Union that would be equitable to all parties concerned. For four years, a standing committee met this union frequently in the effort to accomplish this end. The last meeting in April, 1904, was attended by about 30 officers and business agents of the union and eight of the most representative men of the association, who devoted nearly a week trying to arrive at a satisfactory agreement. At the expiration of this time, they found the union in precisely the same position with regard to union restrictions they occupied at the time the N. F. A. was formed. From then until the present, the association has defended its members whenever they showed to the proper committees appointed for the purpose that they were seriously handicapped in the operation of their business by reason of unjust restrictions imposed upon them by this union.

Cleveland Founders' Agreement.

The labor situation in the Cleveland district, so far as the foundrymen are concerned, has been cleared by the signing of an agreement in which the wage scale is settled as $3.00 for a day of nine hours. This agreement was entered into by Cleveland foundry interests in general. Unusual circumstances complicating the situation made this solution of the labor problem satisfactory for all concerned. The union first presented its demands to the foundrymen, insisting on the increased wages and a shorter day. A counter proposition, favorable to their interests, was made by the foundrymen and was speedily accepted by the union. The agreement contains the following schedule:

THE AGREEMENT.

"The minimum rate of wages for molders of Local No. 218 of I. M. U. of N. A. on and after May 1, 1906, shall be three dollars ($3.00) per day of nine hours. Any molders working less than nine hours to be paid at the rate of thirty-three and one-third cents (33 1-3c) per hour. The time of starting and knocking off to be left optional with the employer.

"The minimum rate of wages on and after May 1, 1906, for coremakers of Local No. 430 shall be two dollars and seventy-five cents ($2.75) per day of nine hours. Any coremakers working less than nine hours to be paid at the rate of thirty and five-ninths cents (30 5-9c) per hour. The time of starting and knocking off to be left optional with the employer.

"Time and one-half to be paid for all overtime, and double time for Sundays and legal holidays. Legal holidays as follows: Fourth of July, Labor Day, Thanksgiving Day, and Christmas.

"That the arbitrary limitation of the daily output on the part of the employes, or arbitrary demands for an increase in the output of the employes on the part of the foundrymen, not being in accord with the spirit of equity which should govern the relationship of employer and employe, all attempts in that direction are to be viewed with disfavor.

"That the right of the foundryman to introduce or operate molding machines in his foundry shall not be questioned. In determining who shall operate them regard should be given to the question of how their best possibilities can be brought out, and how the work can be most economically produced."

Determined Fight at Milwaukee.

Milwaukee, Wis., May 15.—The great majority of Milwaukee foundrymen have refused to accede to the demands of the striking molders, and are engaged in a determined fight for the open shop. The number of men on strike is variously estimated at 1,000 to 1,200. They are out at the plants of the Filer & Stowell Co., the Vilter Mfg. Co., the Allis-Chalmers Co., the Stowell Mfg. Co., the Falk Mfg. Co., the Pawling & Harnischfeger Co., the Prescott Steam Pump Co., the National Electric Co., and several smaller manufactories.

These are all plants comprised in the Milwaukee Foundrymen's Association. There were strikes also at the Nordberg plant, the Power & Mining Machinery Co. works, the Hirsch Bros., Greenslade, Thomas-Aston and Central foundries, but in all of these the men are again back. They have made settlements with the employers except in the case of the Power & Mining Machinery Co. plant. This having been recently absorbed by the International Pump Co., the strikers were ordered back until a conference.

The members of the foundrymen's association have issued a formal statement in which they express the opinion that they have made liberal offers to the men, and say that they cannot be parties to any scheme to force the coremakers into the union. The recognition of the coremakers is the principal question in dispute. The employers say that over half of the coremakers are non-union men.

The molders demanded $3.25 a day for both bench and floor molders, for nine hours' work. The floor molders have been getting $3 and the bench molders $2.80. The employers offered a 10 per cent advance on a 10-hour day, but the men insisted upon recognition of the coremakers and wages of $3 a day. The coremakers now have no uniform schedule. The men came down to $3.15 for floor molders, $3 for bench molders and $2.75 for coremakers. Finally the employers offered to pay the old wages—$3 for floor molders and $2.80 for bench molders—for a nine-hour day. This too, was refused.

Will Strike at Pittsburg.

The demands of molders and coremakers in the Pittsburg district for an advance from the present scale of $3.30 per day to $3.50 per day of nine hours and that those molders now receiving $3.50 per day be advanced 20 cents and all be granted time and one-half for overtime and double time for Sundays, Decoration Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas, has been met by the foundrymen belonging to the Manufacturers' Association of Pittsburg, with the following notice which has been posted in every shop:

NOTICE TO MOLDERS AND COREMAKERS.

"The members of the Manufacturers' Association of Pittsburg and the National Foundrymen's Association after due consideration have decided that as the present wages of molders and coremakers employed in the Pittsburg district are higher than at any competitive point, it is impossible in competing with other districts to make any changes in the wage scale at the present time."

At a meeting of molders Tuesday evening of this week it was decided by a vote of 600 to 44 to strike, and members of the union are now awaiting the arrival of their national president to secure his sanction to their action. There are twenty-one foundries directly affected by this notice and about 1,200 molders will be affected.

Structural Strike Ended.

The structural iron workers of Chicago have settled their grievance with the local contractors. They returned to work on Friday last at an increase of pay amounting to four cents an hour. The former scale was 56¼ cents an hour, and the present scale is a compromise on the original demand for 62½ cents an hour, or $5 a day. At the conference with the union officials during which the above agreement was made, the following gentlemen represented the employers: Robert Vierling, Vierling, McDowell & Co.; Victor Falkenau, Falkenau Construction Co.; John Griffiths, Griffiths & Son; Paul Willis, Kenwood Bridge Co.; C. W. Gindele, C. W. Gindele & Co.; M. R. Vanderkloot, South Halstead Street Iron Works; A. Lanquist, Lanquist & Illsley; A. E. Wells, Wells Brothers Co.

Amalgamated Convention.

The Iron, Steel and Tin Workers' Amalgamated Association, which has been in annual session at Cincinnati since May 2, has practically completed the most important work to come before its deliberations, the agreement upon wage scale demands for the ensuing year. It has been decided that in forge or muck mills, bar and 12-inch guide mills, finishing plate and tin mills and for hammermen and knobblers existing tonnage rates and wage agreements shall remain unchanged. In puddling the basic price was reduced one-tenth to 5.2. The scale in sheet mills is still being considered with the probability of the change from a wage to a tonnage basis.

Tin Plate Workers.

The annual convention of the International Tin Plate Workers' Association has been in session at Canton, O., during the past week. Preliminary and routine work consumed practically the entire week and the wage scale committee did not report until Monday of the present week. The report is exceedingly long and is being considered article by article.

ORE ON DOCKS.

Amount Smaller than for Six Years.—Heavy Movement to Furnaces.

The amount of ore on Lake Erie docks on May 1 of the present year is less than it has been for any year since 1900. The amount of ore on dock May 1, 1906, is 1,791,090, as against 2,271,631 tons for May 1, 1905. Of this amount 24,761 tons were placed on dock during April of the present year. In the accompanying table of movements to furnaces from Lake Erie docks during the winter season the amount placed on dock during April, 24,716 tons, is subtracted in order to preserve the comparative value. The amount on dock Dec. 1, 1905, was 6,438,967 tons, so that during the winter season (Dec. 1 to May 1) 4,672,638 tons have gone forward to furnaces. The total amount of ore moved over Lake Erie docks to furnaces in the full year ended May 1, 1906, was 28,984,358 tons, as against 20,057,070 tons for the year ended May 1, 1905, against 18,739,995 tons in 1904 and 21,905,251 tons in 1903.

Figures showing the total ore passing to furnaces over Lake Erie docks in the year ended with the first of the present month, are found in this way: We know that on Dec. 1, 1905, Lake Erie docks contained 6,438,967 tons; deducting from this 1,766,329 tons, the amount of ore on dock May 1 less April shipments, we find that shipments during the winter period (Dec. 1 to May 1) amount to 4,672,638 tons which added to 24,311,720 tons, the amount shipped to furnaces during the navigation season of 1905 (May 1 to Dec. 1) gives 28,984,358 tons as the entire consumption of ore from Lake Erie ports during the year ended May 1, 1906, as against 20,057,070 tons for the year ended May 1, 1905, as against 18,739,995 tons for the year ended May 1, 1904, 21,905,251 tons for the year ended May 1, 1903 17,216,065 tons for the year ended May 1, 1902, 14,465,260 tons for the year ended May 1, 1901, 15,882,881 tons for the year ended May 1, 1900, 12,122,982 tons for the year ended May 1, 1899 and 10,209,488 tons for the year ended May 1, 1898.

It should be added that April shipments during the present year from upper lake ports were 1,447,386 tons. Of the portion of this that came to Lake Erie ports only 24,761 tons were placed on dock, the balance going directly aboard cars to furnaces.

The accompanying table gives full details of stocks and shipments to furnaces for the years indicated.

ORE ON LAKE ERIE DOCKS MAY 1 EACH YEAR FOR TEN YEARS PAST.

Year.	Gross Tons.
1906	1,791,090
1905	2,271,631
1904	4,534,103
1903	3,592,367
1902	2,848,194
1901	3,050,183
1900	1,720,656
1899	2,073,254
1898	3,167,915
1897	3,256,497

IRON ORE ON LAKE ERIE DOCKS—GROSS TONS.

	OPENING OF NAVIGATION.			CLOSE OF NAVIGATION.		
Ports	May 1 1906	May 1 1905	May 1 1904	Dec. 1 1905	Dec. 1 1904	Dec. 1 1903
Toledo	52,550	71,642	160,216	368,024	318,573	106,710
Sandusky	29,320	44,444	68,863	52,977	75,144	95,275
Huron	80,728	68,104	208,008	208,023	182,495	253,249
Lorain	140,452	165,586	237,404	271,695	299,504	288,581
Cleveland	350,382	513,559	968,508	1,330,619	1,237,033	1,337,750
Fairport	206,162	396,869	579,677	759,961	660,420	845,946
Ashtabula	462,564	623,451	1,559,028	1,589,951	1,403,575	1,911,911
Conneaut	148,528	96,295	128,018	976,976	684,487	591,364
Erie	169,488	236,414	474,273	564,961	583,439	657,409
Buffalo	90,960	61,271	150,106	315,780	318,739	282,890
Total	1,791,090	2,271,631	4,534,103	6,438,967	5,763,399	6,371,085

McKEESPORT PLANT TO BE ENLARGED.

The plans of the National Tube Co. include enlarging the plant at McKeesport, Pa., about 50 per cent above the present capacity and the construction of the largest pipe and tube mill in the world. The present McKeesport plant has an annual output of 300,000 tons and the new mill, which will be completed in about two years, will have an annual capacity of 450,000 tons of steel pipe and tubes from ⅛-inch to 36-inch diameter, inclusive.

The old rolling mills will be entirely torn out and when the plans have been completed the new pipe mill will cover 105 acres of ground, whereas the present plant covers 66 acres.

Three years ago the National Tube Co. decided to enlarge and modernize the McKeesport plant, and actual work has been under way for a little over one year. The plant will be complete within itself and the products will be finished throughout from the raw material.

The company has also decided to replace all the old dock machinery at Lorain with the most modern devices, but the make of machines to be installed has not yet been decided upon.

ELECTRIC PROPERTIES CO.

Takes Over Westinghouse, Church, Kerr & Co.

The Electric Properties Co., New York, was incorporated in Albany, on May 11 with a capital stock of $12,000,000. The new company has already acquired the entire capital stock of the company known as Westinghouse, Church, Kerr & Co., which will as heretofore conduct a general engineering and construction business. The stated purpose of the new corporation is to acquire, finance and develop properties in which electricity is the principal factor. This will include electric lighting, traction and power properties and in addition the company will deal in and guarantee the securities of the properties financed. It is also authorized to issue collateral trust bonds secured by the pledge of securities required in its business.

The capital stock is equally divided between preferred and common stock. The directors are George Westinghouse, Charles H. Allen, Paul D. Cravath, George C. Smith, F. D. Underwood, H. S. Giddings, John A. Spoor, R. B. Van Cortlandt, E. G. Tillotson, Moses Taylor, John F. Wallace and N. W. Halsey.

At the first meeting of the directors held in the offices at No. 111 Broadway, New York, the following officers were elected: President, John F. Wallace, formerly chief engineer of the Panama Canal Commission; vice presidents, George C. Smith and P. F. Thompson; secretary and treasurer, W. A. Esselstyn. The executive committee selected is Charles H. Allen, Paul D. Cravath, N. W. Halsey, Frederick D. Underwood and Robert B. Van Cortlandt.

Scarcity of Charcoal Iron.— It has been found almost impossible to get any good charcoal iron in the southern territory. One St. Louis house has several months' accumulated orders on its books without price consideration. There is not a charcoal furnace in blast in Alabama today. The Gadsden furnace has not yet resumed on account of delay in installing its huge washer. It will probably blow in about June 1. It has accumulated enough charcoal to insure continued operation.

The plant of the Higgins Spring & Axle Co., Racine, Wis., was practically destroyed by fire May 14, the loss being about $250,000.

The San Francisco office of the United States Cast Iron Pipe & Fdy. Co. is temporarily located at 951 Eddy street.

STOVE MANUFACTURERS MEET.

Thirty-fifth Annual Convention Held in New York.—Papers Read.—Officers Elected.

The thirty-fifth annual convention of the National Association of Stove Manufacturers was held at the Waldorf Astoria, New York, Wednesday and Thursday, May 9 and 10. The meeting had a large attendance and entertainment features were prominent. The most absorbing discussions concerned the question of costs.

President Walter P. Warren in his annual address spoke of the general prosperity of the nation, the condition of the iron market, the great increase in the production of stoves and briefly discussed the question of costs and prices. He further referred to the necessity of having strong local associations and the need of more care in selecting and training apprentices. The result of a conference held in New York in September to secure some united action to curb the "repair pirates" was laid before the meeting. It consisted of a resolution to appoint a committee to obtain legal opinion and if favorable to conduct suit in the United States court. In conclusion the president gave the younger members some wholesome advice.

John W. Van Cleave read a paper on "Improvements in Cost Systems" and E. C. Hanrahan in the afternoon gave a blackboard talk on "What is the Most Correct Method for Determining the Relative Commercial Value of Stoves?"

On Thursday morning Edward Bowditch presented a paper on "Cash Discounts," and Abram C. Mott followed with a discussion of the question "What it Costs to Sell Repair Castings." George Mitchell read his paper, "Co-operation Between Local Associations When Members Trade Inside Home Territory." The paper by R. S. Wood on "How to Determine the Value of the Stove Salesman" was ordered printed for general distribution.

During the morning session, a committee presented Ex-President Chauncey H. Castile of the Stove Founders' National Defense Association with a handsome gold watch in recognition of his ten years' service to the members.

An evening smoker was interspersed with vaudeville numbers, and refreshments had been provided by Chairman William J. Myers of the entertainment committee and his assistants. Here the last remnants of formality disappeared and all combined in having a most enjoyable time.

The next meeting of the association will be held in New York City. The following officers were elected: President, Walter P. Warren, Troy, N. Y.; vice presidents, William G. Henry, Chicago, Ill., William J. Myers, New York City; treasurer, Robert L. Morley, Chicago, Ill.; general secretary, Thomas J. Hogan, Chicago, Ill.; board of managers, George D. Dana, St. Louis, Mo., E. W. Anthony, Boston, Mass., Charles A. DuCharme, Detroit, Mich., Edward Bowditch, Albany, N. Y., N. H. Burt, Leavenworth, Kan.

PRODUCTION OF IRON AND STEEL IN CANADA.

The American Iron and Steel Association has received from the manufacturers the statistics of the production of steel ingots and castings and of finished rolled iron and steel in the Dominion of Canada in 1905. It has been necessary to estimate the production of one rolling mill.

The total production of all kinds of steel ingots and castings in Canada in 1905 was much the largest in the history of the Dominion, and exceeded by 221,412 tons that of 1902, the year of next largest production, when 182,037 tons were made. As compared with 1904 the increase amounted to 254,665 tons, or over 171 per cent Bessemer and open-hearth steel ingots and castings were made in both 1904 and 1905, the production of open-hearth steel amounting in the latter year to over 59 per cent of the total. Almost all the open-hearth steel reported in 1904 and 1905 was made by the basic process. The Bessemer steel was all made by the acid process. A few hundred tons of steel were made in 1905 by a special process. The direct steel castings made in 1905 amounted to 9,394 tons, against 6,505 tons in 1904. Our records do not show that Canada has made any crucible steel down to the close of 1905.

The following table gives the production of all kinds of steel ingots and castings in Canada from 1894 to 1905, in gross tons.

Years	Gross tons	Years	Gross tons
1894.....	25,685	1900.....	23,577
1895.....	17,000	1901.....	26,084
1896.....	16,000	1902.....	182,037
1897.....	18,400	1903.....	181,514
1898.....	21,540	1904.....	148,784
1899.....	22,000	1905.....	403,449

The production of all kinds of finished rolled iron and steel in Canada in 1905 was also much greater than in any previous year, and amounted to 385,826 tons, as compared with 180,038 tons in 1904, the year of next largest production, an increase of 205,788 tons, or over 114 per cent.

The following table gives the production of all kinds of iron and steel rolled into finished forms in Canada from 1895 to 1905, in gross tons.

Years	Gross tons	Years	Gross tons
1895.....	66,402	1901.....	112,607
1896.....	75,043	1902.....	161,485
1897.....	77,021	1903.....	129,516
1898.....	90,303	1904.....	180,038
1899.....	110,642	1905.....	385,826
1900.....	100,000	.....	.....

The production of Bessemer and open-hearth steel rails in 1905 amounted to 178,885 gross tons, against 36,216 tons in 1904; structural shapes, 885 tons, against 447 tons in 1904; nail and spike plate, 4,110 tons, against 5,030 tons in 1904; plates and sheets, 4,944 tons, against 3,102 tons in 1904; all other finished rolled products, excluding muck and scrap bars, blooms, billets, sheet bars, and other unfinished forms, but including for 1905 1,120 tons of forging blooms or forging billets, 197,002 tons, against 135,243 tons in 1904. The total quantity of all kinds of iron and steel rolled into finished forms in Canada in 1905, including forging blooms and forging billets, amounted to 385,826 tons, against 180,038 tons in 1904. Of the 385,826 tons of finished iron and steel reported for 1905 about 318,405 tons were rolled from steel and 67,421 tons from iron, as compared with 126,850 tons rolled from steel and 53,188 tons from iron in 1904.

In 1905 the rolling mills and steel works in Canada which operated cut nail or wire nail factories produced approximately 366,800 kegs of cut nails and wire nails, as compared with 324,000 kegs of cut nails and wire nails in 1904.

On Dec. 31, 1905, there were 21 completed rolling mills and steel works in Canada. In addition one plant was being built and two plants were projected. Of the completed plants three were equipped for the manufacture of steel castings only, one for the manufacture of open-hearth steel ingots only, five for the manufacture of Bessemer or open-hearth steel ingots and rolled products, and twelve for the manufacture of rolled products only. The building plant was being equipped for the manufacture of black plates and tin plates and terne plates. One of the projected plants is to be equipped for the manufacture of skelp and bar iron and the other for the manufacture of wire rods.

Of the 21 completed rolling mills and steel works in Canada on Dec. 31, 1905, four were located in Nova Scotia, five in Quebec, ten in Ontario, one in New Brunswick, and one in Manitoba. The single building plant is in Ontario. The two projected plants are also in Ontario.

PERSONALS.

B. F. Harper has been appointed sales agent, to succeed C. H. Rawlins, of the Ft. Wayne Rolling Mill Co., with headquarters at Ft. Wayne, Ind.

John J. Howard has assumed charge of the Ivanhoe Furnace Co. plant, Ivanhoe, Va. He was formerly superintendent of the Pulaski Iron Co., Pulaski, Va.

The Pennsylvania Steel Co. has reelected the following directors to serve for three years: Edgar C. Felton, Frank J. Firth, Francis I. Gowen, Effingham B. Morris and F. C. Smink.

Carl Hoppe has succeeded Mr. M. E. McKee as manager of sales for the Republic Iron & Steel Co., and will also be manager of sales for the Tennessee Coal, Iron & Railway Co. at St. Paul, Minn.

Robert Geddes, of the Jones & Laughlin Steel Co., has gone to San Francisco to look after the interests of his company there and to aid the San Francisco representatives of the company at this time.

A. F. Greaves-Walker has resigned his position with the Olive Hill Fire Brick Co., Olive Hill, Ky., to become ceramic engineer and manager of the Salt Lake Fire Brick Co., Salt Lake City, Utah.

H. H. Campbell, metallurgical engineer of the Pennsylvania Steel Co., who has been seriously ill for some time, is improving slowly. His place as a member of the Harrisburg council has been taken by J. V. W. Reynders, vice president of the Pennsylvania Steel Co.

Louis F. Fieser and Linn Bentley, of Columbus, O., have revived the pig iron firm of Fieser & Bentley, which was dissolved about a year ago when Mr. Fieser retired. The business was continued by Linn Bentley & Co., but with the return of Mr. Fieser the old name has been taken again.

Frederick C. Fraentzel, who has been engaged in the practice of patents and as mechanical engineer at Newark, N. J., since 1885, has associated with himself George D. Richards, an attorney, under the firm name of Fraentzel & Richards. Offices will be maintained in Newark, and at 150 Nassau street, New York.

A. Griggs, superintendent of the Alabama Great Southern railroad, has resigned to accept the presidency of the Alabama & Georgia Iron Co., with headquarters at Cedartown, where the company owns and operates a charcoal furnace. It is stated that its mining properties are to be developed on an extensive scale.

Ralph B. Hayward, manager of the Pittsburg office of the B. F. Sturtevant Co., has resigned to accept the management of the Chicago branch store of the Buffalo Forge Co., with which company he began his career in the fan business. Mr. Hayward enters upon his new duties June 1, being located at 54-60 South Canal street.

D. E. Webster has been transferred to the Chicago sales office of the Westinghouse Electric & Mfg. Co., and William Clegg Jr. has been made acting manager of the St. Louis office in his stead. J. S. Tritle, formerly connected with the St. Louis office has been made acting manager of the new Kansas City office.

G. F. Knapp, manager of the sales department of Oglebay, Norton & Co., Cleveland, has resigned and will carry on the business of a consulting engineer in Cleveland. Before becoming connected with the Cleveland firm 11 years ago, Mr. Knapp had extensive experience in blast furnace supervision and in the manufacture of Bessemer and open-hearth steel.

Arthur J. Vance, superintendent of the Southern Engine & Boiler Works, Jackson, Tenn., on June 15 will assume charge of the Buffalo Forge Co.'s interest in the Cincinnati district. He was formerly Cleveland manager of the Buffalo Forge Co., but was compelled to resign on account of illness from which he has fully recovered since his location in the south.

REPUBLIC-TENNESSEE CHANGES.

Several changes in the official personnel of the Republic Iron & Steel Co. and the Tennessee Coal, Iron & Railroad Co. came to light during the past week. It is announced that W. H. Hassinger, general southern manager of the Republic Iron & Steel Co., has severed his connection with the company to look after private interests. Frank H. Crockard, the new general manager of the Riverside Iron Works of the United States Steel Corporation, becomes vice president and general manager of the Tennessee Coal, Iron & Railroad Co., and vice president and manager of the Alabama plant of the Republic Iron & Steel Co. George L. Collard, of Clairton, Pa., who has been associated with the Steel Corporation, becomes general furnace superintendent for both companies in Alabama, and L. T. Beecher has been made secretary of the executive committee of both companies. F. A. Burr continues as general sales agent of the Tennessee company, and it is announced that John A. Topping will head both companies as president.

CROXTON IS PRESIDENT.

David T. Croxton, heretofore general manager of the Cleveland Furnace Co., Cleveland, O., was chosen president of the company at the recent annual meeting. He succeeds D. B. Meacham, who becomes vice president of the company, in place of S. W. Croxton; C. B. Smith continues as secretary and treasurer, the position of general manager is abolished, and George M. Black continues as superintendent, to which place he was recently appointed. S. W. Croxton is chairman of the executive committee and David T. Croxton has been added to the board of directors. The new president of the company, while a comparatively young man, built the Cleveland furnace and has since managed its operations with signal success. His election by unanimous vote of the board came as a fitting recognition of his work in this connection.

OBITUARIES.

Lewis William Washington, formerly president of the Pittsburg Sheet Steel Mfg. Co., died May 15 at Nice, France. He was born in Pittsburg and was 37 years of age.

Henry G. Williamson, for 36 years in the employ of the Haskell & Barker Car Works, Michigan City, Ind., died April 29, at the age of 70. As mechanical superintendent and engineer of the plant he devised a number of appliances employed in car construction.

Col. Henry H. Adams, president of the Colonial Iron Co., of Riddleburg, Pa., and head of the pig iron firm of Henry H. Adams & Co., of No. 177 Broadway, New York, died suddenly May 6, at his home in Greenwich, Conn. The business of the firm will be conducted by his son, Henry H. Adams Jr.

Wm. E. Newhall, treasurer of the R. D. Wood Co., of Philadelphia, died on May 1, from injuries received in falling through a coal hole which had been left unprotected. He was 71 years old, and had held his position with the Wood company for many years. Mr. Newhall's eyesight was defective, a fact which contributed to his fatal accident.

Charles L. Spier, president of the Staten Island Midland Railroad Co., also president of the Richmond Light & Railroad Co., and associated in many ways with officers of the Standard Oil Co., was shot and almost instantly killed at his home in Staten Island supposedly by a burglar. Mr. Spier was 40 years old and was a member of the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the New York Railroad Club, beside many other societies and clubs. He was a director in a number of transportation and industrial companies.

THE KURZWERNHART GAS-SAVING PROCESS.[1]

BY JOSEPH HARTSHORNE.

Ever since the introduction of the Siemens regenerative furnace, it has been recognized that a certain amount of gas is lost each time the furnace action is reversed. This loss comes, first, from the gas which passes through the free connection between the stack and the gas main, which exists during the time the reversing valve is turning over; and, secondly, from the gas which is in the chamber and flues, from the hearth to the reversing valve, and which flows back into the stack when the valve is reversed. The amount lost each time is, of course, small; but, since a furnace is reversed from four to six times every hour for, say, 300 days in the year, the aggregate is large enough to be well worth attention. The estimate has been published that, in Germany alone, the loss from the first of the above causes amounts to 500,000 marks per year. The loss from the second cause is, of course, much greater.

A process for saving this entire loss, in use at Teplitz, Bohemia, for about three years, would seem to be of value even in this country, where coal is cheaper and where the small economies are not watched as closely as they are in Europe. This process, invented by Mr. Adelbert Kurzwernhart, late technical director of the Teplitz Walzwerk, has been worked out with thoroughness. The loss from each cause can be calculated very closely for any particular furnace, and the results to be expected from the process ascertained. It can easily be decided, therefore, whether it is worth while to adopt it under any given conditions.

The amount of chamber-gas lost depends upon,—(1), the cubic contents of the chamber, ports and flues upon one side of the furnace, up to the reversing-valve (deducting, of course, the volume of the regenerative brick); (2), upon the temperature of the gas in them; and (3), upon the number of reversals per hour. The amount of coal lost depends upon the number of cubic feet of gas evolved from a pound of it; and the final factor in ascertaining the money loss is, of course, the price of the coal per ton at the producer. All of these factors vary greatly among different works, and the value of the process for each particular case must be determined from the special conditions which there exist.

The temperature of the gas varies from about 200 degrees C. at the reversing-valve to about 1,100 degrees C. at the ports; 600 degrees C. may be taken as a fair average for the purpose of calculation. In order to establish a fixed basis for comparison, the volume of the gas must be reduced to that at zero C. by the following formula, in which V_1 is the volume of the gas at zero C., V(=1) is its volume at the temperature of the chamber, x is the coefficient of expansion for each degree C, and t (=600 degrees) is the temperature of the chamber:—

$$V_1 = \frac{V}{V+(x\times t)} = \frac{1}{1+(0.003665\times 600)} = 0.312.$$

In this country the volume of gas produced from a pound of coal ranges from about 25 cubic feet for the lignites to about 72 cubic feet for the best producer coals. A fair average for the coals in general use appears to lie between 60 and 70 cubic feet per pound, say, 66 feet, although some of the best authorities fix this average at 60. The saving in coal per year, in tons, is then found by the following formula, in which S is the net saving in tons, V is the cubic content of the chamber, etc., a is the volume of gas at zero C, from 1 pound of coal, and n is the number of reversings per hour:—

$$S = \frac{n\times 24\times 300\times V\,\frac{0.312}{a}}{2240} = 1.0028\,\frac{nV}{a}$$

For example, assume a 50-ton furnace, reversing four times per hour, and the cost of coal at $2 per ton. The net cubic content of the flues, chamber and ports will be about 3,700 cubic feet. The loss per year will be:—

$$\frac{1.0028\times 4\times 3700}{66}\times 2 = \$449.74$$

If the furnace be reversed six times per hour, as is sometimes done, the loss will then be 50 per cent greater, or $674.61 per year. Of course, the poorer the coal in gas-producing quality, the greater will be the loss, since more of it is required to produce one cubic foot of gas.

The loss through the reversing-valve depends on its area, the duration of the time of reversing, the velocity of the gas-current, and the temperature of the gas in the flue, together with the amount of gas produced by one pound of coal, and the price of the latter. The loss of coal per year is found as follows: A being the area of the reverse valve, D the velocity of the current (taken at 15 ft. per second), t the temperature of the gas, n the number of reversings per hour, and a the volume of gas, at zero C., from one pound of coal, the duration of the reversing being taken at 5 seconds:—

$$\frac{\frac{A\times D}{1+(0.003665\times t)}\times\frac{5\times n\times 24\times 300}{2}}{2240} = \frac{\frac{A\times 15}{1+(0.003665\times 200)}\times\frac{n\times 3600}{a}}{2240} = 139.11\,\frac{An}{a}$$

For a 50-ton furnace, with a 30-inch gas reversing valve, the area of the valve opening is 4.9 square feet, the velocity of the gas-current is about 15 feet per second, the temperature of the gas is about 200 degrees C, the duration of reversing 5 seconds, and the number of reversings is 4 per hour. The loss per year, with coal at $2 per ton, will then be:—

$$\frac{139.11\times 4.9\times 4\times 2}{66} = \$82.71$$

If the furnace be reversed 6 times per hour, the loss will be $124.07 per year. The total loss, from both causes, will be, therefore, $532.45, with 4 reversings per hour; and $789.68, with 6 reversings.

The idea of the Kurzwernhart process is to sweep into the furnace and utilize all the gas in the ports, chamber and flues, which is now lost in reversing, and, incidentally, to prevent any loss through the reversing-valve into the stack. This is accomplished by providing an auxiliary air-valve opening into the gas-flue between the furnace and the gas-valve, as near as possible to the latter, and by closing the gas-valve during reversing. The method of procedure is to close the gas-valve just before reversing, as is now quite generally the practice, and then to open the auxiliary air-valve. The air, rushing in through this opening, sweeps all the gas in the flues and chamber into the furnace, where it is burned with useful effect. When all of this gas has been burned, which is easily determined by observation through the peep-hole, the auxiliary air-valve is closed, the furnace is reversed, and the gas-valve is opened as before.

In considering this process, the possible danger of explosion, when the auxiliary air-valve is opened, at once suggests itself. The best comment on this suggestion is the fact, that, during the three years in which the process has been in use at Teplitz, no explosion has taken place. In reality, however, there is no such danger so long as the gas in the reversing-valve is above the temperature at which it will ignite. When it is above this temperature, the gas will always at once ignite along the line of contact as soon as the in-rushing air strikes it. The product of combustion then formed will act as a separating-layer between the gas and the air, and thus prevent further mixing or combustion. Since the gas is pushed through the comparatively narrow flues and chamber with considerable velocity, there is neither time nor space for the dissipation of the separating-layer.

Little, or none, of the gas is, therefore, consumed in the chamber or flues, and there is no danger of burning out the brick work more rapidly than usual.

[1] A paper read before the Bethlehem meeting of the American Institute of Mining Engineers.

Experience has shown that there is no difference in the life of the brick-work whether the process be used or not. Of course, any heat that may be produced by the gas which burns in the valve-casing, or beyond it, goes into the furnace, or is absorbed by the checker-brick, and is thus utilized.

Another possible source of trouble is the leaking of the auxiliary air-valve during the ordinary working of the furnace, more especially because this valve is usually a simple flap. If there be a plenum in the gas-flue, as was usually the case formerly, the only result of

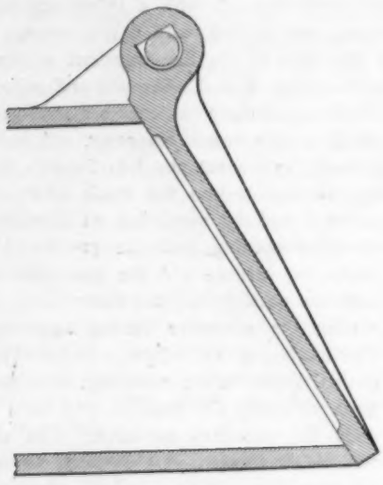


FIG. 1.—SUPPLEMENTAL AIR VALVE.

such a leak would be a little loss of gas, which would detract just so much from the economy of the process. Under conditions of present practice, however, there is often a slight vacuum in the gas-flue, resulting in a small in-draft through whatever leak there may be. This vacuum should not ever exceed 0.2 inches of water, and probably does not average more than 0.16 inches. If the air so entering be of sufficient quantity, trouble might be caused by combustion, provided it entered the valve-casing, but no calorific loss would result, as stated above, except, possibly, from radiation.

There is no reason, however, why this supplemental gas-valve should be allowed to leak, even if the most convenient form, that of a flap, be used. Such a valve can easily be constructed so that it will always close tightly, and a simple and effective form is shown in Fig. 1. The flap lies at an angle of about 60 degrees, and is made stiff enough to resist warping under ordinary conditions. The bearing and seating surfaces are finished, and enough play is provided between the journal and its bearings to prevent jamming, and to allow the flap to adjust itself by its own weight. The upper part of the journal-bearing is made flat instead of round, to allow this self-adjustment to take place more freely. A valve so constructed will always seat itself tightly, and will continue in good condition for a long time. This form is in use at Teplitz, and it has never leaked any appreciable amount.

A proof of the absence of leakage at the auxiliary-valve, or elsewhere, is the fact that it is impossible to draw much of the gas from the chamber into the furnace by merely shutting off the gas-valve, and then waiting a certain length of time before reversing. In the absence of some opening to admit the air behind it, only so much of the gas will pass into the furnace as is forced out by the expansion due to the greater heat of the chamber. Moreover, should any leakage occur, it would have to be very considerable to do any harm. A slight amount of air mixed with producer-gas does not make it either explosive or combustible, and any small amount of flame, produced directly in front of the leak, would be extinguished by the gas itself.

Another objection which has been urged against the process is the fact that cold air is admitted to the gas chamber, thus absorbing an undue amount of heat, which is lost when the furnace is reversed and this air passes out into the stack. The air does carry out a greater amount of heat than the gas does under present practice, but calculation shows that the loss from this cause is very small, as compared to the saving by burning the gas effectively. This is also shown by the fact that careful tests of the fuel consumption of furnaces run for a certain length of time with the Kurzwernhart process and for the same length of time without it, other conditions being kept as similar as possible, have shown that the coal saved was 8.5 per cent greater, by actual weight, than that which, by calculation, was to have been expected.

Although there is no danger of explosion in using air to sweep the gas into the furnace, when ordinary care is used, it can be made absolutely impossible by a modification of the process in which the products of combustion are used for this purpose instead of air. In this case, a reservoir is provided of sufficient capacity to hold a little more than enough of these products to replace the gas in the chamber and flues. This reservoir may be built either of plates above ground, or of brick work under ground, according to preference or convenience. During the ordinary running of the furnace, there is open communication between the smoke-flue, reservoir and chimney, which is so regulated by damper that the reservoir is kept full at all times. At the time of reversing, the main gas valve is shut, and also the connections between the reservoir, smoke flue and chimney. A valve, placed between the reservoir and the gas flue, as close to the reversing valve as possible, is then opened, and also one between the reservoir and the outer air. The air rushes into the reservoir and forces the products of combustion ahead of it into the flues and chamber, thus sweeping the gas into the furnace. As soon as all of the gas is burned, the connections between the reservoir, gas flue and the air are closed, those between the reservoir, smoke flue and chimney are opened, the furnace is reversed, and the main gas flue is opened.

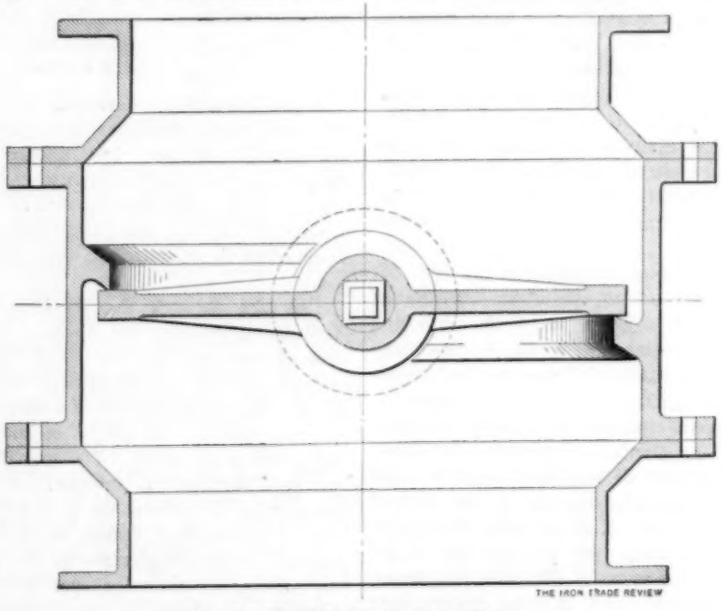


FIG. 2.—SUPPLEMENTAL GAS VALVE.

It will be seen at once, that the only difference between this method, and the use of gas direct, is the substitution of a thick, extraneously produced, separating layer of products of combustion between

the air and the gas for the comparatively thin layer. The advantages of this use of the products of combustion, instead of air direct, are,—that explosion is made absolutely impossible, that all trouble from a possible leak in the auxiliary air valve is prevented, and that less heat is lost when the products of combustion pass back out of the chamber into the smoke flues, since the temperature of these gases, when they enter the chamber, is considerably higher than that of the outside air. As already stated, however, there is, under proper conditions, no danger of explosion when using air direct; there is no leakage of air through the auxiliary valve, when it is properly made; and the loss entailed by the use of cold air as a pushing agent is hardly worth considering. On the other hand, the smoke process involves a more complicated apparatus, and requires more floor space.

The apparatus for either variety of the process can be applied to any existing form of reversing valve. A detailed description of many of the applications of the air process has already been published; but the general principles can be sufficiently shown by means of the application to the Forter and to the Siemens reversible valve. While with proper arrangements the main gas valve can be used to shut off the gas during reversing, if it be preferred, or if conditions require it; yet there are some reasons which may make it seem desirable not to use the valve for this purpose; for instance, the great weight of the larger sizes, and the natural desire to avoid risking a disturbance in the relation of the gas valve to the air valve, when once established. In such a case, a simple form of shut-off valve can be added, to be used only at the time of reversing. The question as to which method is to be followed is one of personal preference or economy, except in those cases in which there is no room to introduce the supplemental gas valve. Fig. 2 shows a very convenient, cheap, effective and durable form of this supplemental gas valve.

Fig. 3 shows a very convenient arrangement for the Kurzwernhart air process, with supplemental gas valve, as applied to the Siemens, or similar, reversing valve. The counterweighted lever, *a*, is keyed fast to the journal on which the diaphragm of the supplemental gas valve is fastened. The chain wheels, *R* and *T*, which are cast in one piece, turn freely on this journal. The wheel, *T*, has a pin, *b*, projecting from it, which engages under the lever *a*. A chain is also fastened to it, which leads to the quadrant, *S*, on the journal of the auxiliary air valve, *K*. Another chain passes around the wheel, *R*, and also over a sprocket hand-wheel on the platform near the lever of the reversing valve. The supplemental gas valve is shown in the full open position.

At the time of reversing, the hand-wheel on the platform is turned to the right, and is followed by the wheel, *R*. The lever, *a*, follows the pin, *b*, downwards, and thus closes the gas valve tightly by means of the counterweight. In the meantime, the slack of the chain has been taken up on the wheel, *T*, and, by continuing the motion of the hand-wheel in the same direction, the flap valve, *K*, is opened as far as is desired. When all the gas has been burned in the furnace, the hand-wheel is turned back to the left until the air valve, *K*, is closed. The furnace is then reversed, and the hand-wheel is turned back to its original position, thus fully opening the gas valve. This point is fixed by a stop for the hand-wheel or lever. There must be sufficient slack in the chain leading to the air valve to prevent the latter from opening until the gas valve is tightly shut. The whole arrangement is simple, cheap and effective, and has successfully met all the conditions of practice.

An arrangement, to be used with the Forter valve, is shown in Fig. 4, in which the main gas valve is also used as a shut-off valve during reversing. The stem of the gas valve passes through the nut, *a*, which slides up and down in the frame, *B*. The opening of the gas valve is adjusted by screw and hand wheel, in the usual way. From nut, *a*, projects the pin, *b*, which engages in the cam-slot of the double quadrant, *A*. Lost motion is provided for at *C*, so that the valve may be shut by means of the quadrant, no matter what may be its opening. From each end of the quadrant a chain leads to the corresponding door in the Forter valve casing.

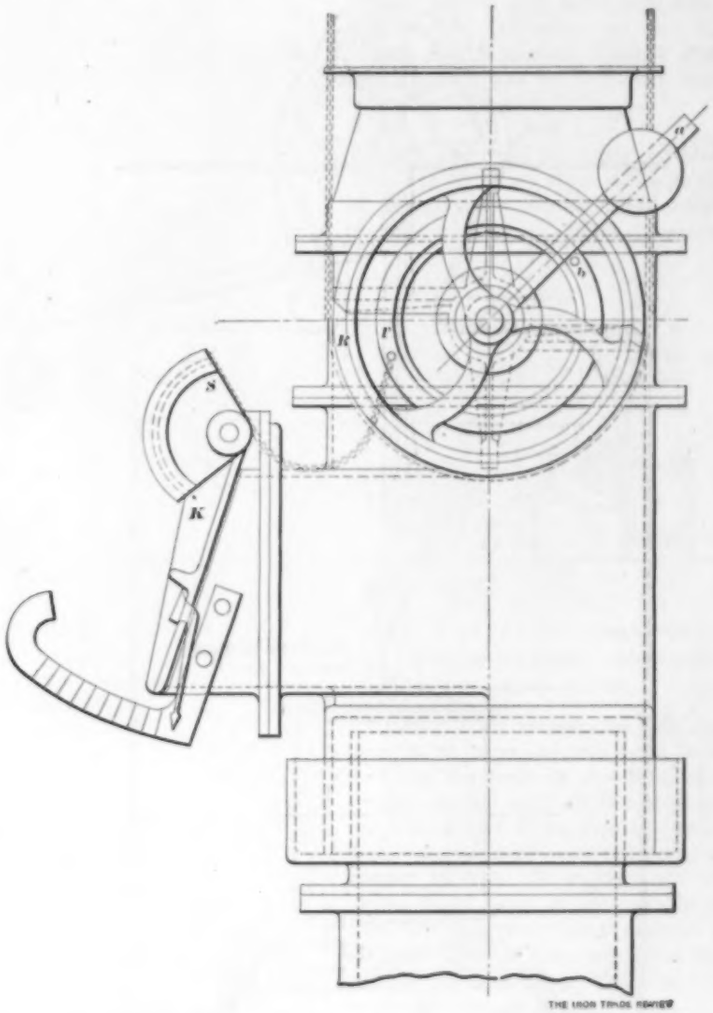


FIG. 3.—KURZWERNHART ARRANGEMENT FOR SIEMENS REVERSING VALVE.

As a matter of precaution, the air is always brought into the casing over the hood, so that it will sweep all of the gas before it into the flue. If it were brought in at the other end, it would at once turn down the flue, and thus leave a pocket of dead gas at the other

end of the casing, which might possibly form an explosive mixture with the air. There is small danger of this occuring, but the possibility would better be avoided. This principle of avoiding all dead ends or pockets for the gas should be applied in designing any particular arrangement, since unnecessary risk of any kind ought to be avoided. It is, therefore, necessary to use, alternately, the doors at each end.

In order to assure the opening of the proper door, and to prevent the opening of the wrong one, a bolt, *D*, is arranged on the valve casing, operated by a cam-slot on the reversing lever, in such a way that the door of the hood-end is free, while that of the down-comer is locked.

When the furnace is to be reversed, the quadrant, *A*, is turned down towards the locked end of the casing. The pin, *b*, follows the slot of the quadrant, carrying with it the nut, *a*, and the gas valve. The gas valve is closed when the pin reaches the bottom of the semi-circular part of the slot, which is then on the vertical axis of the valve stem. The motion of the quadrant is continued in the same direction, and the air door is opened as far as is desired. A stop should be provided for the quadrant, and the amount of opening can be adjusted by shifting the chain. Enough slack, however, must be provided in the latter to assure the closing of the gas valve before the air valve begins to open.

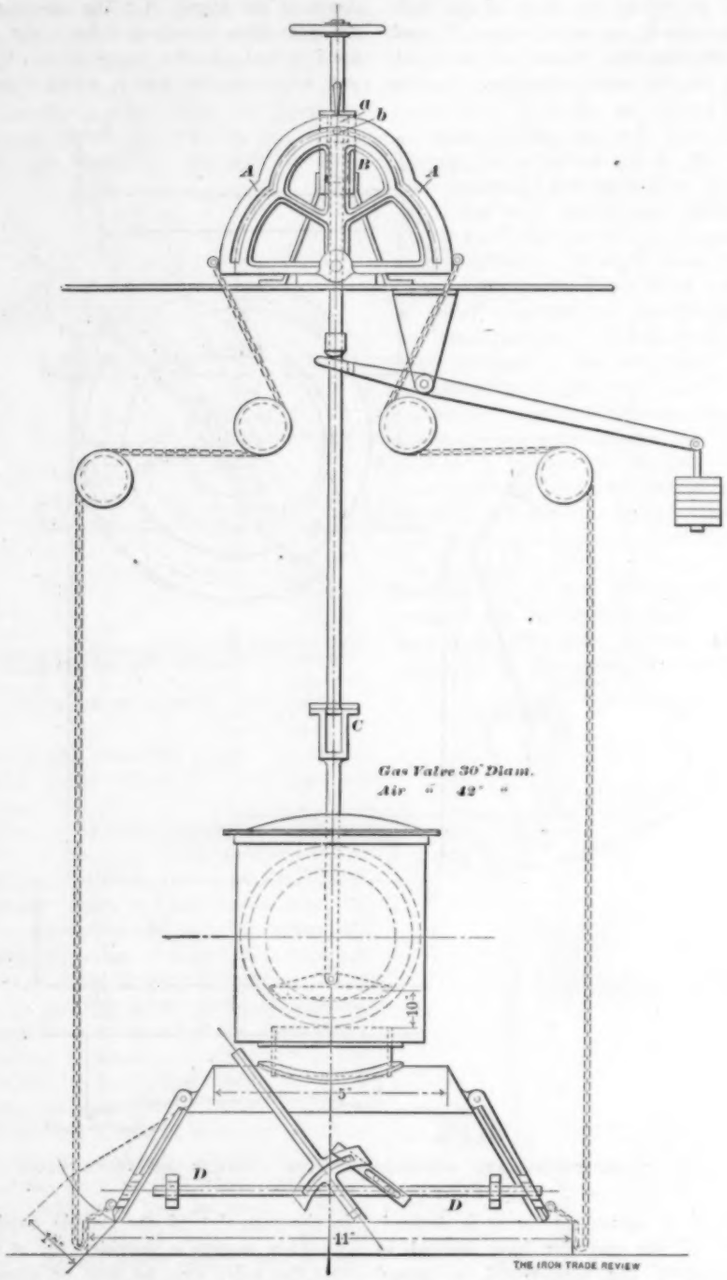


FIG. 4.—KURZWERNHART ARRANGEMENT FOR FORTER REVERSING VALVE.

When the gas is all burned, the quadrant is raised until the air valve is closed. The furnace is then reversed, and the quadrant is raised until the nut is again in its highest position. The main gas valve is then open, just as it was before reversing, and its adjustment with the air valve is not disturbed. In case of large furnaces it will probably be necessary to counterbalance the gas valve on account of its weight. The weight of the doors on the valve casing will also have to be adjusted to balance the quadrant.

If it be preferred to use a supplementary gas valve instead of the main gas valve, for shutting off the gas during reversing, it is inserted between the latter and the casing of the reversing valve. The same quadrant is used, but it has no connection with the stem of the main gas valve. The nut, *a*, becomes simply a sliding block, to which a guided rod is fastened. This rod carries a pin, which manipulates the counter-weighted lever, in the same way as does the pin, *b*, in Fig. 3.

If it be desired to use the main gas valve as a shut-off valve during reversing, in connection with the Siemens, or similar, valve, the arrangement shown in Fig. 4 can be used, but only one-half of the double quadrant is required.

Figs. 5 and 6 show an arrangement for the use of the products of combustion as the direct agent for sweeping the gas into the furnace. In this case the reservoir is built of brick and placed underground. *A, A* is the reservoir; *I* is the auxiliary gas valve; *C* and *D* are the valves regulating the products of combustion and the admission of air; and *B* is the damper which controls the flow in the smoke flue and reservoir, and which is entirely distinct from the ordinary draft-damper. During the running of the furnace, this damper is so placed as to force enough of the products of combustion, through the reservoir to keep it entirely full. At this time the valves, *C* and *D*, are so set that the portion of the products of combustion, which goes through the reservoir, passes up through the opening, *II*, down *III*, up *V* and down *IV* into the smoke flue again. When the furnace is to be reversed, *I* is first shut, and the valves, *C* and *D*, are reversed. This shuts off the connections with the stack flue at *II* and *IV*, and opens that with the outer air at *VI* and with the reservoir at *III*. The air flowing in through *VI* forces the products of combustion from the reservoir up through *III* and *II* into the gas flue, just below the auxiliary gas valve, *I*, thus sweeping the gas before it into the furnace. When the gas is all burned, the valves, *C* and

D, are reversed, thus closing the connections with the stack flue and the air, and opening those between the stack flue and the reservoir. The furnace is then reversed, and the auxiliary gas valve, *I*, is opened as before. It will be noticed that all three of the auxiliary valves are operated by a chain from one hand-wheel and that one continuous motion will throw them all in either direction. Sufficient slack is provided in the chain to insure the shutting of the gas valve, *I*, before the valves, *C* and *D*, begin to move.

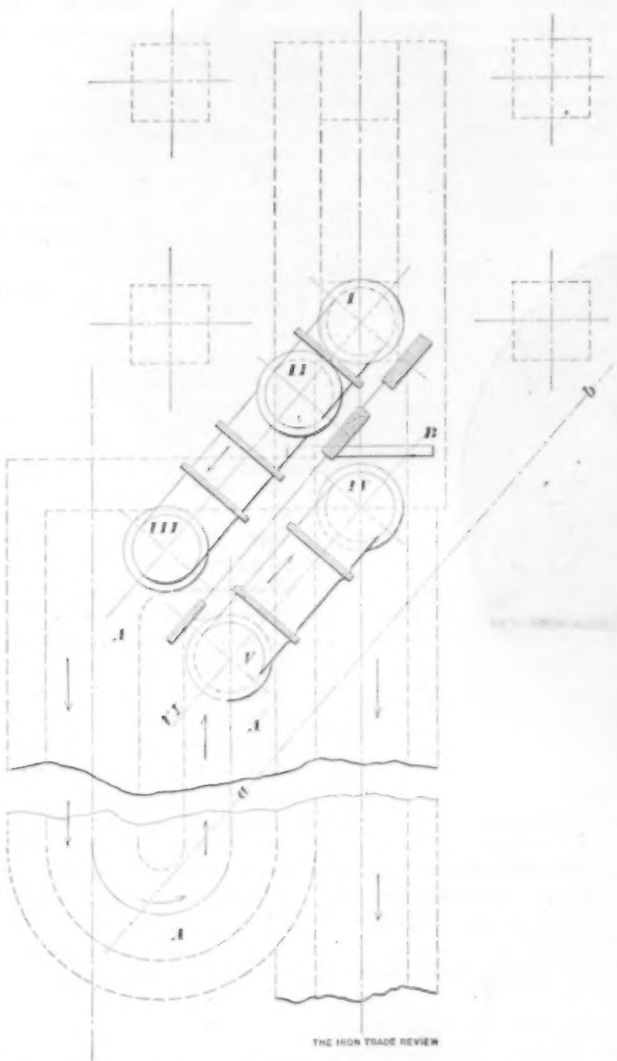


FIG. 5.—KURZWERNHART ARRANGEMENT FOR SMOKE PROCESS PLAN.

If a plate-tank above ground be preferred to the underground one, or if the space at disposal requires it, the arrangement, as far as the valves are concerned, is precisely similar to that described above, suitable connections being made through tubes. Since the products of combustion in the reservoir are considerably cooler than the gas in the chamber and flues, the former need not be as large as the latter. A reservoir having 60 per cent of the cubic contents of the chamber and flues will be amply sufficient.

METHOD OF SKIMMING SLAG FROM MOLTEN METAL.

A patent on a method of skimming slag has been granted to M. M. Suppes of Elyria, Ohio. The idea in this invention is to displace the slag by immersing therein a displacing body, thereby causing the slag to rise to the level of an overflow passage, through which it escapes. The displacing body is preferably of a higher specific gravity than the liquid metal. In carrying out the invention, the hot metal to be skimmed is placed in a suitable vessel, but, it is not necessary to provide a special vessel for the purpose, as the method may be ordinarily carried out while the hot metal is in the ladle. The displacing body, usually of refractory material, as ganister, magnesite, or dolomite, is attached to a metal rod, by means of which it may be raised or lowered.

METHOD FOR DETERMINATION OF PHOSPHORUS AND ASH IN COKE.

BY JOHN F. HOY.

As every chemist knows, who has coke analyses to make, the methods in use at the present time for the determinations of phosphorus and ash are very long and tedious, and a method which would considerably shorten these determinations would be welcomed.

The method here given first originated in the laboratory of the New Jersey Zinc Company, Hazard, Pennsylvania, and has never to my knowledge been in print.

Ash.

Brush one gram of finely powdered coke into large weighed platinum dish of about 150 cc. capacity; add enough absolute alcohol to sample to make a thin paste. Now revolve the dish slowly so as to cause the thin paste to run up along the walls of the dish. Keep up this motion until all the alcohol is evaporated and there remains only a thin film of sample over the walls and bottom of dish. Now place the dish over a blast lamp, or in a muffle furnace, and in five to seven minutes the carbon will have been entirely burned off, the ash remaining. Weigh and calculate percentage of ash.

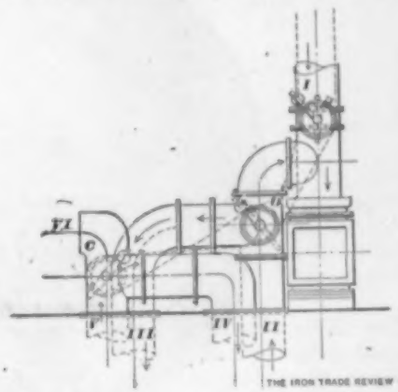


FIG. 6.—KURZWERNHART ARRANGEMENT FOR SMOKE PROCESS.

Phosphorus.

Five to ten grams of sample should be taken. Proceed as in ash determination. When the carbon has all been burned off, add to the ash in dish 10 cc. of dilute HCl and 29 cc. HFl. Evaporate to dryness under a good hood but do not bake. When cool add 15 cc. of HCl and heat. The residue should all dissolve, but a little insoluble matter may be filtered off and neglected. Pour the solution into a flask, add NH_4OH, then HNO_3, and then molybdic acid solution, and "shake down" phosphorus. The yellow precipitate may be either weighed direct or titrated.

A LOW RESISTANCE THERMO-ELECTRIC PYROMETER AND COMPENSATOR.[1]

BY WM. H. BRISTOL.[2]

For a great variety of industrial processes and also in scientific research the ranges of temperature required do not exceed 2,000 degrees Fahr. The low resistance pyrometer herein described has been developed to meet the existing demand for an instrument to fully cover this range of temperature; one which would be accurate, reliable and comparatively inexpensive, taking into consideration both the initial cost and the cost of maintenance; also one that might be readily adapted to varying conditions for industrial operations and be successfully operated by an ordinary workman.

FIG. 1.—WALL TYPE, THERMO-ELECTRIC PYROMETER.

As the title implies, this pyrometer depends primarily upon the well-known thermo-electric couple, consisting of two dissimilar metals or alloys joined at one end. When the junction of such a couple is located at a point where the temperature is to be measured, an electro-motive force is developed, which is a function of and depends for its value upon the difference of temperature at the junction and that at the opposite or so-called cold ends of the two elements forming the couple.

At the present time many of these couples are successfully employed for the determination of high temperatures. They are almost invariably used in conjunction with an extremely delicate high resistance galvanometer, which, according to Le Chatelier, is indispensable, 200 ohms being mentioned as a minimum resistance allowable in the indicating instrument. This amount of resistance is necessary to practically eliminate the atmospheric temperature influence upon the resistance of the elements forming the couple, the leads and the coils of the galvanometer itself. If the galvanometer be of a high resistance type it is evident, that if sensitive to the minute current of electricity corresponding to the very low electro-motive force produced by the couple, it must be delicately constructed and consequently requires great skill and care in its handling and operation. The sensitive coil of the instrument is usually suspended by an extremely fine wire and the instrument must always be leveled and located upon a solid foundation before observations can be made.

The platinum-rhodium couple instrument above described may be classed as a high resistance pyrometer when compared with the low-resistance pyrometer of which the following is a description: It consists of three parts: couple, indicator and leads to connect couple and indicator. The leads between the couple and the indicator may be of almost any desired length to meet the special requirements, the combined resistance of the leads, couples and indicator are fixed to suit the total range of the instrument and varies from 3 ohms as a minimum to 10 as a maximum. The indicator is a low-resistance instrument of special design, and is made especially for the writer by the Weston Electrical Instrument Co. The accuracy, permanency, and portability of these instruments is well known.

Fig. 1 shows a wall or switch-board form of the indicator. Fig. 2 illustrates a portable form. These indicators are made with pivots in jeweled bearings in place of the delicate suspension by fine wires which are generally considered necessary in the high resistance type of indicator or galvanometer for this work. The elements used in the low-resistance system give a much greater electro-motive force than the platinum-rhodium couple, which is a great advantage in gain of motive power for the operation of the indicating instrument.

The particular metals or alloys applicable for a pyrometer of this type should have a fusing point higher than the maximum temperature to be measured; and when formed into a couple should produce a high electro-motive force with practically uniform increase of same proportional to the increase of temperature. As the result of many experiments with different metals and alloys to determine suitable materials to meet these requirements, couples have been finally adopted which consist of alloys of tungsten, steel, nickel, iron and copper; different alloys being employed to suit the total ranges of temperature that it is desired to have the scale cover.

Since no rare metals are used for the couples, this part of the pyrometer is inexpensive and it is possible to employ elements of large cross-section, which will not be affected in their resistance any appreciable amount by the variation of temperature along the lengths of the elements forming the couple. The leads to the indicator are made of flexible insulated copper duplex cable and of ample cross-section to practically eliminate the influence of variations of atmospheric temperature. The cross-section of the elements of the couple is reduced at their junction, thus rendering it sensitive to sudden changes of the temperature to be measured.

A novel feature of the couple is that it is made separable at the point where it passes through the wall of the space within which the temperature is to be measured. The object of the joint is two-fold: first, to make it possible to renew the "Fire-end" whenever it may be necessary; and second, to permit carrying the cold ends of the elements to a point toward the floor where the atmospheric temperature will be constant and not influenced by the temperature that is being measured. Fig. 3 shows a complete element with separable joint, coiled leads and lamp plug on the end of the cable forming the leads for convenient

[1] Presented at the January 1906 reunion in New York City and re-presented at the Chattanooga meeting (May 1906) of the American Society of Mechanical Engineers.

[2] Professor of mathematics in the Stevens Institute of Technology, Hoboken, N. J.

connection to the indicating instrument shown in Fig. 1.

A special feature of the joint is that it is provided with large bearing surfaces to prevent possibilities of variations of resistance at the connection and is constructed to allow for easily breaking and making the connection.

FIG. 2.—PORTABLE TYPE, THERMO-ELECTRIC PYROMETER.

The details of the joint are shown clearly in Fig. 4, and from this it will be seen that it is impossible to make the connection incorrectly, as is usually done when there is nothing to guard against it.

The low cost of the couples makes it practicable for the user of the instrument to keep an extra fire-end in reserve, which may, at any time, be quickly substituted for the one that has been in continual service, thus affording an economical and positive check upon the accuracy of the instrument.

The elements of the couple are independently insulated in a novel and effective manner by winding each with asbestos cord and then coating the surface with carborundum paint, a solution of silicate of soda being used as a binder. This makes a clean, compact and smooth insulation. Couples thus insulated are flexible and can either be applied to the heated space directly or they may be inserted into a piece of ordinary pipe as a protection. This protection has proven itself to be effective and economical.

For continuous applications of the couples to temperatures in the neighborhood of 2,000 degrees Fahr. or over, special protecting tubes of nickel, plumbago or porcelain are employed.

These pyrometers are furnished with scales for total ranges of 600, 1,200, 2,000 and 2,600 degrees Fahr. Reproductions of these scales are shown in Fig. 5. The graduations of these scales are determined by the fusing temperatures of lead, zinc, aluminum and copper, which give sufficient points on the curves for use in making a complete graduation of the scales. The divisions are also further checked by the use of a standardized Le Chatelier platinum-rhodium couple, and a Siemens-Halske suspension galvanometer. For very open scales over shorter ranges several couples may be placed in series, thus making it possible to read to small fractions of a degree.

A novel application of the thermo-electric couple is that of determining the temperature of molten metals, as cast iron, copper, brass and bronze. It consists in leaving the ends of the elements disconected and without insulation. When these ends are slightly immersed in the molten metal it makes a junction between the elements and the reading will be same as if the elements of the couple had been originally joined. The advantage of this plan is that the reduced cross-section at the ends of the couple allows it to almost instantaneously attain the temperature of the molten metal, consequently there is no lag error—a most important advantage. As the couple is used over and over again, the ends become worn away, but the couple is, nevertheless, always ready for use by immersion of a fresh portion, which will not be changed in any way by continued use and will give the same reading for a given temperature as if the couple had not been worn away. A joint is provided near the end that is immersed so that a fresh tip can be applied to the couple before enough of the end has worn away to appreciably affect the resistance of the complete system.

Compensators.

As already mentioned, it is well known that the electro-motive force generated by a thermo-electric couple is a function of the temperatures at the hot and cold ends.

For refined measurements it is therefore necessary to make allowance for changes of temperature at the cold ends of the couple when readings are taken unless some means is provided to maintain them at a constant temperature. This is sometimes done by immersing the cold ends in ice water or by having a water jacket around the ends through which there is a flow of water at some known temperature.

In the low-resistance thermo-electric pyrometer system, comparatively small

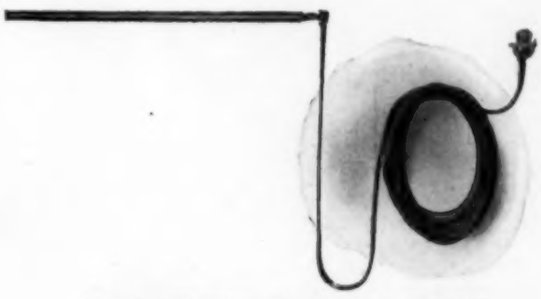


FIG. 3.—COMPLETE ELEMENT OF THERMO-ELECTRIC PYROMETER.

FIG. 4.—SEPARABLE JOINT FOR THERMO-ELECTRIC PYROMETER.

changes in the actual resistance of the circuit including couple, leads and instrument will produce sufficient effect to correct for atmospheric changes at their cold ends. A compensating device to automatically correct for changes of atmospheric temperatures at their cold ends has been devised which makes it possible to dispense with the cumbersome means for maintining the cold ends at constant temperature or the necessity of taking readings of temperatures at the cold ends.

This compensating device is shown in Fig. 6. It consists of a glass bulb with a short stem, similar to an ordinary mercurial thermometer. Two

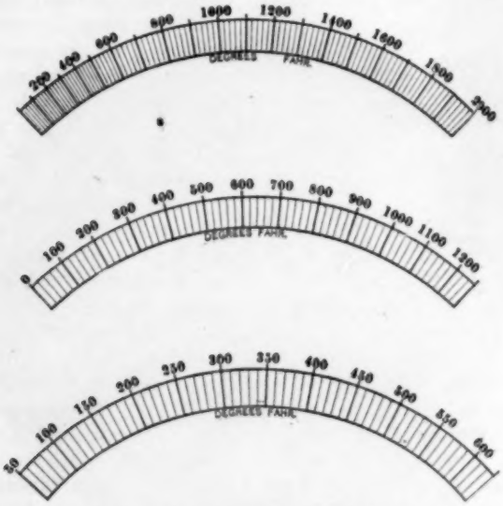


FIG. 5.—SCALES USED ON THERMO-ELECTRIC PYROMETER.

platinum terminal wires are fused into the stem near its top. These are connected within the bore of the stem by a loop of fine platinum wire, thus completing the circuit as indicated in the diagram. The size of the bulb, the cross-section of the bore of the stem, and the cross-section of the platinum wire loop are proportioned to suit the case in hand.

The compensator will perfectly compensate for any particular point on the scale, as, for instance, the working point, where it may be desired that the reading shall be absolutely independent of changes of temperature at the cold ends. It will readily be seen that if the temperature rises at the cold ends the mercury rising in the stem will short-circuit a certain portion of the platinum loop, thus reducing the resistance of the entire circuit by exactly the necessary amount so that the diminished electro-motive force of the couple due to the rise of temperature of the cold end will send the same amount of current through the circuit and instrument, and consequently give the same reading as if there had been no change of temperature at the cold ends.

The compensator acts on precisely the same principle, but in a reverse manner, when the temperature falls at the cold ends, the resistance of the circuit being increased as the column of mercury lowers in the stem. The increase produced in the resistance of the circuit prevents the increased electro-motive force of the couple due to the fall of the temperature at the cold ends from sending an increased current through the instrument, therefore the reading remains unchanged. The compensator may also be employed within the indicating instrument to correct for atmospheric changes of temperature upon the instrument itself where extremely accurate results are required.

General Advantages of Thermo-Electric Pyrometers.

As compared with other forms of apparatus for measurement of high temperatures, the thermo-electric pyrometer has many advantages, of which the following are the most important: They may be employed where the space is extremely small and inaccessible. They are practically independent of temperature variations intermediate of their hot and cold ends. They are independent of pressure and rough usage at the point where the temperature is desired to be measured.

The indicating instrument can be located at the most convenient point, practically at almost any distance from the couple. They are extremely sensitive to changes of temperature and respond instantaneously—that is, there is no lag error. They are constant in their indications when the couples are properly protected. They permit the determination of the temperature at many different points by means of several couples and leads connected to one instrument, provided with suitable switching device.

Special Advantages of Low Resistance System.

The important advantages of the low-resistance, thermo-electric pyrometer system may be summarized as follows: A commerical switchboard or portable dead-beat indicating instrument may be employed instead of the extremely delicate suspension galvanometer required for use with a single platinum-rhodium couple. It affords a practical method for automatically compensating for the changes of temperature at the cold ends of the couple, as already described. It makes it practicable to use the same indicating instrument and the same couple for different total ranges of temperature by using different binding posts and having several scales drawn, the proper resistances being inserted for each individual total scale. The application of low-priced metals and alloys as a substitute for platinum and rhodium makes it possible to install a number of couples, and by means of proper switching devices use an instrument for quickly determining the temperatures at the locations of the different couples. In many instances the first cost of the expensive platinum elements prohibit their use in this way.

Applications.

Many applications of this instrument will suggest themselves. A few of the important ones are mentioned, as, for example: in a boiler test where nineteen couples were simultaneously applied at different points between the furnace and the flue. From the data obtained a curve was drawn showing the temperatures at all points along the path of the products of combustion from the furnace to the flue, the abscissas corresponding to the square feet of heating surface, and the ordinates to degrees Fahrenheit. The value of such data for investigating and studying the economical working of steam power plants will be appreciated. The couple can readily be applied to the steam space of a boiler and used to show the degree of superheating.

These instruments have also been adapted to and are especially valuable in maintaining the desired temperatures for annealing, hardening, tempering and blueing of steel. When many small parts are handled, as in the manufacture of watches, a practical method of using the pyrometer is to adapt the pot containing the articles to the end of the couple and using it as a handle for inserting the pot into the furnace or into an ordinary forge fire. By revolving the pot it is heated perfectly

uniformly, and as soon as the proper temperature is reached it is shown on the indicator, and all guess work is eliminated.

They have been most successfully employed in lead-hardening baths. For this purpose the couples are protected by wrought iron pipes, and will last for months without renewal. After constant daily use for many weeks the couples give the same readings as when first installed.

In addition to making it possible to obtain absolutely uniform results with a given lot of steel it has been found that the life of the pots has been increased, as they are not overheated. From this fact it naturally follows there must be an economy of fuel as a result of using the pyrometer.

FIG. 6.—COMPENSATOR FOR THERMO-ELECTRIC PYROMETER.

Application has also been made to galvanizing baths, affording means for keeping the molten metal at the proper temperature for the work, preventing overheating and wasting zinc by vaporization. They have been used to keep molten lead at correct temperature in the manufacture of shot.

These instruments have also been tried and are now being tested for indicating the temperature in the carbureter and superheater of a Lowe water-gas plant, where the process of gas making depends upon proper temperatures and the pyrometer shows when the steam and oil should be turned off and the blast turned on, and also when these operations should be reversed in order to obtain the most efficient results. By using two or three couples in the carbureter it is possible to adjust the spray of oil so that every part from center to shell will be working to the best advantage.

The instruments have also been successfully employed in chemical works.

[When this paper was first presented in New York, a number of prominent engineers were present and discussed it. The more important of these discussions are here appended.—Editor.]

Henry Souther.

After some twelve years' experiment with pyrometers, and after numerous attempts to introduce them practically into commercial surroundings, I appreciate Professor Bristol's remarks very much. It seems to me his pyrometer smooths out a great many of the rough places, and that it is of a more practical nature than the Le Chatelier type, with its necessarily delicate galvanometer. Also the terminals of the platinum and platinum-iridium or rhodium thermo-couple of the Le Chatelier type become very friable with use. Professor Bristol's couple seems to overcome this objection. The difficulty has always been in introducing the Le Chatelier thermo-couple that every once in a while it failed, and the men using it became disgusted and sidetracked the instrument.

The difficulties in the way of the use of the pyrometer have been practical, and not inherent in the pyrometer as an instrument. The necessary galvanometer is essentially a laboratory instrument, the thermo-couple is delicate and requires nursing. These objections are very serious about a shop.

The use of a pyrometer in a furnace where there are hot and cold draughts is always unsatisfactory, and I believe always will be. If the pyrometer is to be used in a furnace it should actually be buried among the parts or in the material being heated, and not subjected to the draughts of a furnace.

The ideal use for a pyrometer is in connection with a molten bath of lead, cyanide, salt or whatever may be convenient. The temperature of such a bath can be perfectly measured, and the material immersed in it acquires the same temperature if left there long enough. The personal equation of the operator disappears almost entirely, which is not the case, nor can it be in connection with a furnace where the couple is suspended over or near the work, and not actually in contact with it.

Professor Bristol's thermo-couple will stand a lot of abuse, and, better yet, will stand immersion in molten baths for a considerable length of time. His electrical instrument is not of the delicate type peculiar to the high resistance platinum, platinum-rhodium couple. It is for these practical reasons that I believe the Bristol instrument is more acceptable than any other type presented at this time.

R. L. Penney.

In manufacturing firearms it becomes necessary in many cases to be able to determine quickly the temperatures of baths, furnaces, etc.

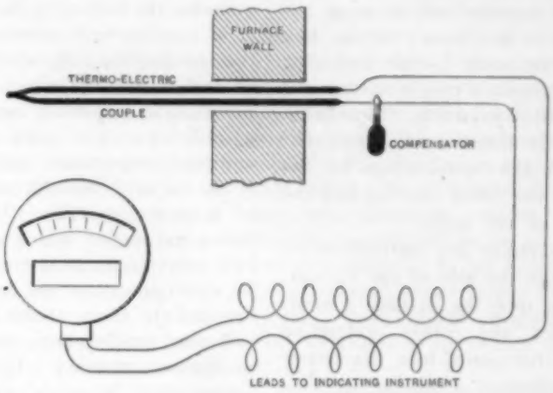


FIG. 7.—METHOD OF SETTING UP THERMO-ELECTRIC PYROMETER.

Beginning with last June, we have introduced this pyrometer, and at present we are using it in four different branches of our work, hardening, tempering, blueing and annealing, also using it in place of the Le Chatelier for experimental work. The results obtained so far leave very little to be desired. The instruments are arranged so that the workman knows just what he is doing, and the element of doubt and uncertainty is eliminated.

The hardening furnaces each have a couple, a compensator, and a set of leads, while one instrument does for all. The instrument is placed on the wall in a place convenient for all the workmen; near it is a small switchboard containing a switch for each furnace, the switch having a common connection to the instrument. The leads are brought from the several furnaces to the individual switches. The furnaces and switches are numbered to correspond. By this means a workman, who, we will say, is working on No. 4, is required to keep his furnace at a certain temperature. He goes to the switchboard and throws in No. 4 and reads the temperature directly, without making any correction, with-

out waiting for an oscillating needle to come to rest. The couples are introduced into these furnaces from the back, the fire-ends being enclosed in a porcelain tube. These couples have required no attention since they were set up. The same scheme is applied to our tempering and blueing baths, using a lower range instrument. In these last two applications accuracy and permanency are very essential points. With these pyrometers as now in use we are enabled to obtain results that are unchanging from day to day.

In annealing, these instruments and couples are of great benefit. On account of the inexpensiveness of these couples we use two for each furnace, one to measure the temperature of the furnace and another to measure the temperature at the center of the box containing the work to be annealed. The leads from each couple are carried to a double-throw switch. The workman in charge throws the switch one way to find the temperature of the furnace, and the other way to find the temperature of the work.

The two couples are introduced together through the side of the furnace, one reaching into the furnace a short distance, and the other extending through the fire space into the center of the box through a hole in its side. This arrangement has been found to be satisfactory and enables the workman in charge to handle the furnaces as if they were machines, slacking and starting them up as necessary.

Prof. Wm. Kent.

The accurate measurement of high temperatures is a problem of ever-increasing importance to the industrial arts. It is greatly to be desired that those who are trying to improve the commercial methods of measuring high temperatures will be able to produce an instrument by which any temperature up to 3,500 degrees Fahr. may be read by a workman as easily as he can read the pressure of steam in a steam gauge, and that these instruments shall also be reasonably durable under sudden alternations of temperature, which the pyrometers using porcelain tubes are not.

It is well known that in steam boiler practice the average economy of any boiler ordinarily is at least ten per cent lower than what the same boiler is capable of when all the conditions of running are exactly what they should be. If the boiler is not over-driven, the variable condition which influences economy the most is the amount of air supply per pound of fuel. If this can be kept down from 18 to 22 pounds of air per pound of carbon, the economy will be a maximum, but if it is increased to 30 or 40 pounds, as very often happens in ordinary boiler practice, the economy will fall off rapidly, especially at high rates of driving. The trouble is that the ordinary fireman has no means of knowing when his air supply is just right. He has two means for controlling it, one regulating the damper, and the second varying the thickness of the bed of fuel, but he cannot vary it intelligently, for he has no means of measuring or indicating the air supply. It can be indicated by a pyrometer, for the less the air supply, provided it is not so small as to make imperfect combustion (which is not likely to take place below 18 pounds) the higher is the temperature. It is possible with almost any kind of coal containing not over two per cent of moisture to obtain a furnace temperature, in a furnace roofed over with a fire-brick arch, of 3,000 degrees Fahr., and this temperature can be maintained if the firing is done in small quantities at frequent intervals. If the fireman had a pyrometer which would indicate just what his furnace temperature was, he could so adjust the thickness of the fire and the force of the draft to maintain that temperature, and thus obtain maximum economy. If such a pyrometer could be made with a registering attachment, so that the superintendent of a plant may at times know what temperatures have been maintained in a furnace, it would lead to a great increase in economy of fuel in steam boiler plants.

Another branch of industry in which measurement of high temperatures may prove to be of considerable importance is the welding of steel pipe. A series of tests made by Mr. T. N. Thomson, of the International Correspondence Schools, and reported recently to the American Society of Heating and Ventilating Engineers, shows that the strength of the weld in an apparently good steel pipe may vary anywhere from 50 per cent to 90 per cent of the strength of the steel itself. It is highly probable that this difference in the strength of welds is due to a difference in the temperature of the furnace in which the steel is heated, and if so, the use of a pyrometer would help in the discovery of the proper temperature, and also be of assistance to the men in charge of the furnace to enable them to know just when the temperature was right. In the heating, tempering and annealing of steel the question of temperature is all important, and much more uniform results could be obtained if pyrometers were used by the workmen in charge of these several heating operations.

Albert A. Cary.

There is probably no field of scientific research opening the way to more useful information in the manufacturing and chemical arts than careful and accurate observations of the effect of temperatures upon various substances, and also the thermal study of furnaces required to effect these heat actions.

In days gone by, and not at very remote dates either, we have heard of wonderful results obtained by experimenters treating certain substances, or combinations of materials, by heat; such remarkable results being obtained accidentally. Weeks and months of careful effort have often followed such accidental discoveries to reproduce them, but without avail.

It is safe to assert that in most of these cases an accurate knowledge of the action of heat upon these substances would have helped the experimenter to reproduce these results in a very short time. To illustrate roughly the importance of this assertion, I will refer to certain thermal information necessary to alloy work.

Gold and copper have been frequently used together to form useful metal mixtures, and for a long time, previous to a comparatively recent date, it was not known whether the fusion or freezing point of copper was higher or lower than gold. The fusion and freezing point of gold was determined quite accurately at 1,949 degrees Fahr., but it was not until after carefully constructed high temperature measuring and recording apparatus was used that the uncertainty concerning the freezing point of copper was settled, when it was found to have two freezing points, viz., 1,949 degrees Fahr., and 1,983 degrees Fahr.

The higher temperature was obtained by melting the copper exposed to the oxidizing effect of the air, and in the course of ordinary practice all sorts of freezing temperatures are obtained between these two limiting degrees.

Aside from the peculiar behavior of such metals, subjected to heat treatment, it has been found, through delicate and careful heat measurements, that in many chemical products certain reactions and combinations take place between narrow ranges of temperature and without the use of accurate pyrometers it would be impossible to duplicate these products, and produce them uniform in quality.

The recent appearance of reliable high temperature measuring devices

has benefited the arts in more than one direction.

A manufacturer of twist drills, reamers, and other tempered steel tools told of a rejection of over 10 per cent of his finished product when he was depending upon the judgment of his employes in tempering these tools, but since introducing pyrometers for controlling the temperatures of his heat treatments, his rejection of finished tools is today practically nil.

There is probably no metal requiring such refinements in heat treatment as steel, as those interested can find by referring to a lecture by the late Sir William Roberts-Austin on the hardening and tempering of steel, delivered before the British Association in 1889, and published in Vol. 41 of *Nature*.

Generally speaking, the state of pyrometry in this country, as applied to manufacturing and chemical industries, is, even at the present time, in a deplorable condition, and many of the instruments which we find in use are obsolete and unreliable, and incapable of leading to improvements in methods of manipulation or in refining products.

The thermo-electric pyrometer, like all other scientific and engineering apparatus, has its limitations. It can only be used to measure temperatures at short distances from the interior of a furnace wall, being thus limited by the length of the element as well as the length of its surrounding cover. It cannot be used to measure temperatures above the fusing point of the metal composing the element, nor the fusing or softening point of its surounding protective casing.

When temperatures are required beyond these ranges of distance or temperature, I am using optical pyrometers. I have found the Wahner optical pyrometer wonderfully accurate, and it can be as carefully calibrated from known points of fixed temperature as the thermo-electrical pyrometer, and besides, being constructed upon a purely mathematical basis, the instrument can be accurately graduated to read high degrees of temperature far beyond points where we have any means of calibration, and I have read temperatures in electric furnaces as high as 4,500 degrees Fahr., knowing that my error is not over 11 degrees.

Mr. E. A. Uehling.

The more we learn about the effect of temperature in operations in which heat is a controlling factor, the more we feel the want to get out of the realm of guessing, into that of knowing, and as means have been gradually developed to determine with a closer degree of approximation of the temperatures employed, and the more their influences have been studied the more pronounced has become the desire for accurate knowledge of the heat requirements, and hence heat measurement.

I happen to be one of those of whom our President has said, that when entering from the college into the field of metallurgy, found a most deplorable lack of knowledge of temperatures employed and no means at all, or at best very inadequate means for measuring such temperatures. Although this was less true of the blast furnace operations, with which the writer became most intimately connected, yet the pyrometers in use were very unsatisfactory. From the time of the introduction of the hot blast by Neilson some attempt has been made to measure its temperatures. Bars of lead and zinc were used, which gave some indication from which a guess at the temperature could be made. Later the expansion pyrometer came into quite general use.

Feeling very keenly the want of an instrument which would measure temperatures accurately, the writer devised numerous more or less (generally less) satisfactory means for measuring high temperatures, none of which was enough better than those existing to be worthy of further development, and he finally struck upon the principle upon which the pneumatic pyrometer is based.

We have today three forms of pyrometers, each fulfilling the conditions of accurate heat measurement, based on three distinct principles, first, the pneumatic; second, the electric, and third, the optic principle, each of which has its own peculiar advantages.

For temperatures above the melting point of platinum the optic pyrometer reigns supreme; for temperatures below 3,000 degrees Fahr., where readings are to be taken at many points in more or less rapid succession, the electric pyrometer has no rival. Both these instruments have the advantage of easy portability. Where temperatures are to be continuously indicated and recorded at the same place, or for longer or shorter intervals of time at places within a radius of moderate distance, say 100 to 200 feet, the pneumatic pyrometer answers better than either of the other two.

I consider the continuous autographic record of the temperature involved in any process in which heat is a controlling factor of paramount importance.

In this respect the pneumatic pyrometer has no equal. Another feature in which the pneumatic pyrometer stands alone is that in addition to making a continuous autographic record it will, if found necessary or desirable, indicate the temperature at several places at the same time.

The pneumatic pyrometer has now been on the market for over ten years, and has become the standard blast furnace instrument. It is installed at over 75 per cent of the blast furnaces in this country for indicating and recording both the temperatures of the blast and the top gas. It is extensively used in England and also on the Continent; three of them went to Japan.

The highest temperature measured with the pneumatic pyrometer was 3,350 degrees Fahr. This temperature was found in one of the tube-welding furnaces of the National Tube Works at McKeesport.

The upper limit of temperature that can be measured with the pneumatic pyrometer today is the point where platinum begins to get very soft. For continuous indication 2,500, possibly 2,700 degrees Fahr. cannot safely be exceeded. For short time exposure 3,000 degrees can be measured, but for all heat measurements where an autographic record has no value, the electric pyrometer is to be preferred, and for occasional observations of temperatures above 2,000 degrees Fahr., Wahner's optical pyrometer is the one to use.

Professor Bristol has acquainted us with a number of advantages possessed by his thermo-couple over the platinum-rhodium couple, of which the most important, to my mind, is its cheapness. This factor will accelerate the diffusion of knowledge of heat treatment and accentuate the necessity of accurate heat measurement, and thus broaden the field of practical application of all good pyrometers. There is nothing that has done more to retard the science of pyrometry than the use of cheap inaccurate and unreliable pyrometers. A cheap, accurate and reliable instrument as that of Prof. Bristol promises to be and will have a very great stimulating effect.

Prof. Wm. H. Bristol.

For the rapid measurement of the temperatures of objects and metallic bodies the thermo-electric couple may be employed to great advantage. For illustration, if it is desired to obtain almost instantaneous indications of the temperature of a metallic plate, the ends of the elements forming the hot end of the couple, may be left disconnected and reduced to points at their extremities. If the pointed ends of such a couple are pressed against the surface of the plate at the desired point, the metal will serve as the electric conductor between the end points of the elements, and their junctions will

immediately assume the temperature of the plate, giving a corresponding instantaneous response on the indicating instrument. By simply pressing the points of the couple at different places on the metallic body the different temperatures at the various points may quickly and accurately be determined.

For application of this form of the couple to the measurement of the temperature of objects that are not electric conductors, a thin metallic sheet may be placed on the surface of the object and the couple then pressed against it. To insure that the temperature of the junction is that of the object itself, a sheet or layer of heat resisting material, as asbestos, may be applied to the object at the point when the temperature is desired. The elements of the couple may be joined in the usual manner and then pressed against the object. When so made this method of measuring the temperature of solid objects is equally applicable, whether the objects are electric conductors or not.

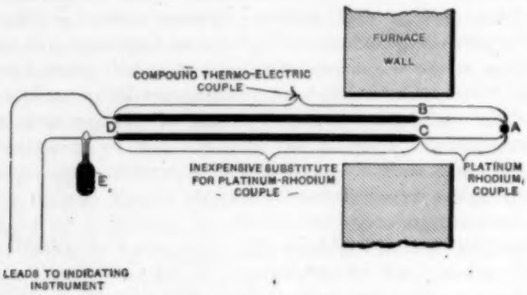


FIG. 8.—THERMO-ELECTRIC PYROMETER FOR VERY HIGH TEMPERATURES.

To make the low-resistance thermo-electric pyrometer applicable for measurement of temperatures as high as 3,000 degrees Fahr. where the couple is to be exposed to the full heat to be measured, metals like those of the Le Chatelier couples or their equivalents having high fusing points must be employed. A compound couple, which will serve the same purpose as that of platinum-rhodium, has been devised, but which is less expensive.

It consists of two parts, which, together, form the complete couple, as indicated in Fig. 8. The part which is exposed to the full heat to be measured is made of platinum-rhodium and is of sufficient length to reach a point where the temperature will not exceed 1,200 degrees Fahr. From this point to the extreme cold ends of the couple the elements are made of inexpensive alloys, as indicated in Fig. 8. This portion of the couple is of ample cross-section to eliminate changes of resistance that would otherwise be produced by variations of temperature along the length of the couple.

Two thermo-electric junctions, B and C, are introduced into the circuit where connection is made between the low-priced alloys and the platinum-rhodium elements, but the electro-motive forces generated at these points may be made equal and opposed to each other if the proper alloys are employed.

Although no common metals or alloys have as yet been found which give a perfect balance or neutralization of the thermo-electric effects for wide variations of temperature at the secondary junctions B and C, it has been determined that alloys of iron and nickel will give a very close balance for ranges of temperature from the atmosphere to 1,200 degrees Fahr. at these points. For this range of increase of temperature at the secondary junctions there is a small positive excess of electro-motive force which may be compensated for by the introduction of an auxiliary resistance into the circuit in close proximity to the secondary junction, the resistance being placed in series and made of material which will increase in resistance with the rise of temperature at the junction, and consequently the compound couple taken as a whole will be the same as if the entire couple was made of the platinum-rhodium elements.

Automatic continuous records of the indications of this pyrometer may readily be made on a chart sheet which is arranged to move at the proper rate just behind the end of the indicating arm, but not in the least interfering with its natural motion. The record sheet is unsupported over its active portion and is periodically vibrated by the clock movement into contact with the end of the indicating arm and produces a record upon the chart sheet showing its position at the instant of vibrations. By timing the period between the vibrations of the chart the contacts may be made so as to produce a continuous record.

The record may be made by ink carried by the indicating arm or the surface of the record sheet may be coated with some easily removable substance.

For recording automatically rapid changes of temperature, a current from an induction coil may be passed from the end of the indicating arm through the chart of frequent intervals.

MUCH ACTIVITY

At Iron Ore Properties at Negaunee on the Marquette Range.

(Special correspondence.)

Negaunee, May 10.—The new shaft started a few months ago at the Breitung Hematite property, at Negaunee, Marquette range, is completed. It is 175 feet in depth, seven by eighteen feet in dimensions, and accommodates two skipways and a ladderway. It is located about 400 feet distant from the Mary Charlotte shaft, with which it will be connected by a drift. It is estimated that it will take nearly two months to complete this drift, and until it is finished only the rock removed from the drift will be hoisted through the new shaft. The two mines, adjoining properties, are owned by the Breitung-Kauffman interests of Marquette. Recently at the Mary Charlotte stockpile one steam shovel crew loaded 113 railroad ore cars in ten hours, a record which it is believed will stand throughout the season. It took three switch engines to keep the shovel busy; two for hauling and one for spotting the cars. The occasion of the haste was a rush of boats under charter to take out cargoes of Mary Charlotte ore from the Marquette docks.

The work of installing the electric haulage plant at the Steel Corporation's Blue mine, a member of the Regent group at Negaunee, has been finished, and the new system of tramming has gone into commission. Two motors will be used for spotting the cars in the drifts and for hauling the loads to the shaft, with a third motor retained underground for use in cases of emergency. Besides furnishing power for the haulage system, the new machinery installed will supply current for electric lighting. It is of ample capacity to supply all the lights needed in the various underground workings of the Regent group, and also for lighting the buildings and stockpiles on surface. In case a need for more haulage power develops, it will be possible to furnish it, as the generating machinery can be operated to furnish 50 per cent more power than its guaranteed capacity.

The Stegmiller mine, in the Swanzy district, south of Negaunee, is being put in condition for a resumption of operations at an early date. The property is controlled by the United States Steel Corporation, but has not been worked

for a number of years. Three or four years ago the company erected a large boarding house near the mine and prepared to resume active mining, but subsequently changed its plans. The mine has one shaft bottomed in ore, and considerable exploratory work with diamond drills has been done. The property was formerly known as the Brotherton and was opened for the American Mining Co., formerly the iron mining department of the American Steel & Wire Co. It adjoins the Princeton mine of the Cleveland Cliffs Iron Co.

The work of unwatering the old American mine, in the district west of Ishpeming, has been started and will be pushed actively until all the underground openings are dry. The property has been taken over by the M. A. Hanna interests of Cleveland, and will again be brought to the producing stage. One pump, capable of working out 1,200 gallons of water a minute, is in service, as are two blowers, which together handle about 2,000 gallons a minute. The latter can be operated successfully for the first 200 feet, after which it will be necessary to pump out the balance of the water in the mine. The property is about 400 feet deep. It was opened in 1880 as the Sterling, and was reorganized in 1887 as the American. The mine was not looking badly when work was suspended in September, 1892, owing to the financial straits of the company.

FREE ALCOHOL LAW

Would be Disastrous to Important Interests of Michigan.

(Special Correspondence.)

Marquette, Mich., May 10.—That if enacted into law the bill removing the revenue tax from denaturized grain, or vegetable alcohol will deal a severe blow to important industries in the Lake Superior region, is the contention of large interests operating in the hardwood districts of Michigan, Wisconsin and Minnesota. The effect upon the production of wood alcohol and the kindred product, acetate of lime, would be serious, but no more so than in the case of the allied products of charcoal, pig iron and hardwood timber. Indeed, it is declared, the bill is a menace to the primary industries of the hardwood timber states.

The managers of the various chemical plants of the north country have after careful investigation become convinced that the proposed exemption of denaturized alcohol from the internal revenue tax would deprive them of a market for the larger portion of their wood alcohol output, drive many of their plants out of business, and render the separate production of acetate of lime unprofitable. This, in turn, it is asserted, would materially enhance the cost of producing charcoal and pig iron. The cost of charcoal, without the simultaneous production of wood alcohol and acetate of lime, would be nearly doubled, and the cost of charcoal pig iron increased $1.50 to $2 a ton. The improved quality and extended uses of coke iron have brought it into such close competition with charcoal iron that the increased cost of the latter which would be brought about as a result of the proposed legislation would undoubtedly greatly curtail its production and eliminate a large portion of it from the market. In short, it is contended, the direct effect of the bill would be to transform the production of charcoal pig iron from a profitable into an unprofitable industry and menace its very existence.

The considerable charcoal iron, charcoal and by-products industries of the north country have grown up together, and so intimate is their relationship with one another that no one of them can be affected, without consequences, injurious or beneficial as the case may be, to the others. Combined, they represent in upper Michigan alone the means of livelihood of thousands of wage-earners and the investment of millions of capital. Obviously, it is declared, the proposed law would take great values out of the forests of all hardwood states. Much of the standing hardwood timber is refuse and inferior wood, and without some practical means of utilizing it in connection with the manufacture of hardwood lumber the legitimate profits of the latter industry would be seriously curtailed, if it were able to be continued under the new conditions. The availability of the charcoal plants and the furnaces as a market for hardwood refuse and hardwood timber not suitable for manufacture has greatly enhanced the value of hardwood stumpage within the territory where the joint manufacture of hardwood lumber and iron has been carried on, and, moreover, in lumbering it has permitted a clean sweep to be made of the ground, with the important result that vast areas are cleared for the settler and the cultivation of the soil years earlier than would otherwise be the case, with the further result of an immediate enhancement, in many cases, of the value of the soil.

The proportion of refuse timber which under present conditions has a marketable value is of considerable size, running from ten to twenty cords to the acre. The cost of cutting, hauling and transporting this waste wood will average, including ten cents for stumpage, $2.50 a cord, or from $25 to $50 for the product of one acre. All of this additional value, except the ten-cent stumpage, represents employment, or wages, to men and teams and railroads. When it is considered that this hardwood timber covers many hundreds of thousands of acres, its value to labor and industry is realized. It employs thousands of men, supports communities all over the timber-producing states and facilitates the development of agricultural interests and the permanent growth of towns and villages.

Thus, it is argued, the passage of the free alcohol bill would make unprofitable the utilization of this waste wood by destroying the wood alcohol industry, and by wiping out a large portion of the value of the inferior timber would increase the cost of hardwood and diminish the value of the timbered land. This is the reason why the pending legislation is viewed with alarm by timber owners, farmers, wage-earners and railroads interested in hardwood districts. It jeopardizes their business and property values, they say, and offers nothing definite or tangible, but only a chance for an experiment to see whether denaturized vegetable alcohol can be made a product that can compete with gasoline.

NEAR EVELETH

The Steel Corporation Will Open a Mine.—Other Mesabi Properties.

(Special Correspondence.)

Hibbing, Minn., May 10.—Following diamond drill operations in progress for a year or more, the Steel Corporation is preparing to open a mine in Section 26, 58-17, near Eveleth, Mesabi range. The company controls ten forty-acre tracts in this section, and it is said that enough is known of the ore deposits to practically assure the development of a mine rivalling the giant Fayal in importance. In the same field are the Malta, Pettit and Hobart properties. The new mine will be developed by both the underground and open-cut system. Four of the remaining forties of Section 26 are in the possession of Gov. Higgins of New York and associates.

The Williams mine at Biwabik, formerly known as the North Cincinnati, is being reopened by the Thomas Furnace Co. of Milwaukee. The property has two shafts, one of which was sunk shortly before operations

were suspended three years ago. The ore does not run high in metallic iron, but it is of good structure, working well in furnace practice, and it is expected the property will henceforth operate steadily until exhausted. A shaft house is being constructed over the new shaft. Ore shipments will be started in about a fortnight.

The Mahoning Ore Co., half of the capital stock of which is owned by the Cambria Steel Co., and the remainder by the Steel Corporation, Republic Iron & Steel Co. and other interests, will ship about a million tons from its Mahoning mine this season, an amount which has represented the annual output of the property for several years past. The company owns a very large acreage, as yet undeveloped, in the Hibbing district, some of it adjoining its present gigantic producer, and sufficient is already known concerning the ore bodies to indicate reserves of truly enormous extent.

The Longyear mine, at Hibbing, has been acquired by the Jones & Laughlin interests, and not by Pickands, Mather & Co., as reported in some quarters. The Mayas Iron Co.'s property on the eastern Mesabi will make an initial shipment of about 150,000 tons this season, it is expected. The ore is going to Two Harbors over the Duluth & Iron Range road. The deposit at the Mayas is so located on a hillside that it is mined very cheaply, the ore being dumped through chutes directly into the cars beneath. The overburden, which is very shallow, is being removed by steam shovel.

It will not be long now before the western Mesabi extension of the Duluth, Missabe & Northern road is in commission, and the development of the Steel Corporation's Canisteo, Holman and other mines will then go forward rapidly. It has been necessary to haul all supplies and material by team from Grand Rapids, and during the winter this furnished profitable employment to farmers in the vicinity, many of whom netted from $800 to $1,000 for their few months' work. It is a conservative estimate that 100 teams were employed in the freight transportation during the winter. At one time seventy of these were engaged in hauling coal to the Canisteo and Holman properties, where in all about 8,000 tons of the fuel were delivered. Other commodities handled were lumber and various other kinds of construction material, boilers and machinery. The average load for a four-horse team ran between 8,800 and 10,000 pounds; the record was 15,500 pounds, or more than seven and one-half tons. The biggest load hauled by a single team was 8,800 pounds.

STEEL TRADE BENEFITS

By Extensive Building Under Way for the British Navy.—Pig Iron Dull.

(Special Correspondence.)

Birmingham, Eng., May 1.—The holidays are to some extent responsible for the comparative quiet prevailing in the iron trade. In South Staffordshire, nearly all the works last week took a full week's holiday, making use of the opportunity to clean out canal wharves, and do other repairs. In the Sheffield district, where demand is decidedly better, nearly all the works re-commenced on Wednesday. This district is still benefiting by the large amount of metal, including armor plates, required for the big battleship, the Dreadnought, and the other cruisers required for the navy. The orders for the battleships are only very slightly benefiting the Midlands, several firms in which have received orders for chains. Messrs. H. B. Parkes & Co., of Tipton, have several orders, and six of their most reliable chain makers are turning out the Dreadnought mooring chains. The metal of each link is no less than 4½ inches thick, and the breaking strain is beyond the power of any testing machine in the district. This is the biggest chain ever made in South Staffordshire.

The northern district is now reaping the full benefit of its position on the seaboard, the lack of which advantage is partly accountable for the much quieter tone in the Midlands, where the range of demand is of much more restricted character. The North of England Iron and Steel Manufacturers' Association has just appointed Mr. R. W. Davis, of the Rise Carr Works, Darlington, chairman, and Mr. G. Ainsworth, of Consett, their vice president.

Holding Back Orders.

The Midland trade is in a very uncertain condition. Buyers are doing all they can to force down the market, and some specifications of iron, which they could do very well with, are being kept back. Some of the mills, notably those engaged on sheets, hoops and gas strip, are working short time, and prices generally have gone off several shillings a ton. The makers of galvanized corrugated sheets, for instance, are in a very different position from what they were a couple of months ago. Still, on the whole, the fall is rather slow and there may be an early recovery.

Nobody seems to be selling any pig iron, and some furnaces have sold nothing worth mentioning since February. Only isolated firms, and these by no means the larger ones, are really wanting pig iron orders. The great majority are all right for months ahead, and flatly refuse to make more than a trifling reduction. Now that Cleveland iron is recovering, stocks having been reduced by fifteen thousand tons during the last month, it seems likely that the downward progress will be arrested. A new company, the Gittings Patent Iron & Steel Co., has just been registered with a capital of £7,000 in £1 shares to take over the business of iron and steel manufacturers and merchants formerly carried on by E. Gittings, Jr., at Wisemore, Walsall, as the Wisemore Iron & Steel Works, and lately purchased by J. G. Walton and T. Wood, with whom an agreement is to be made. The subscribers are L. E. Pilkington, E. Gittings, Jr., T. Wood, C. R. Pilkington, W. Bailiff, H. E. Embleton, and W. J. Port.

The will has just been proved of Colonel C. Lowthian Bell, formerly director of Messrs. Bell Brothers, Ltd., and Dorman Long & Co. The gross value is £182,864 and the net value £176,940. The testator divides practically all his wealth among his relatives.

Some Large Orders.

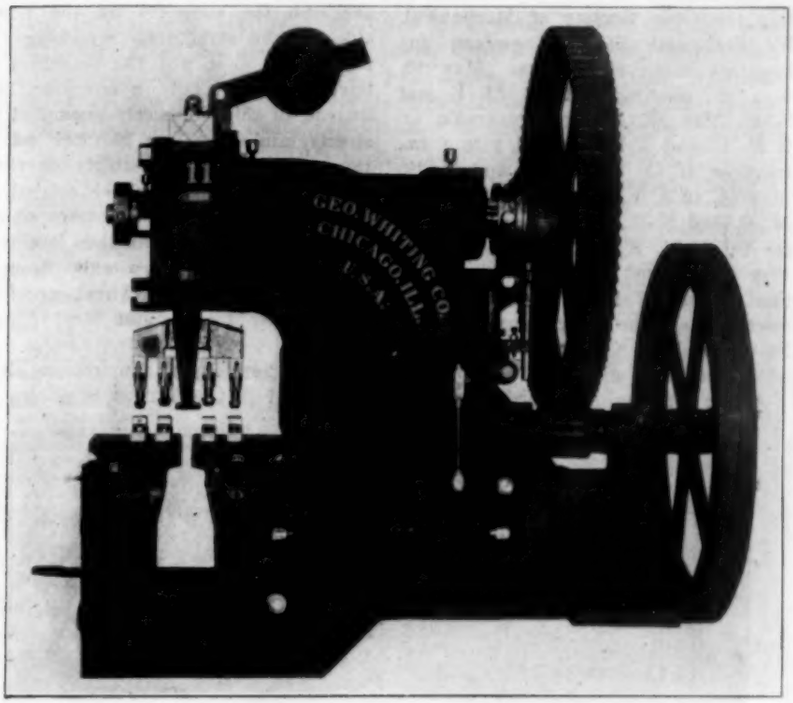
Among the firms kept busy by the ship building trade is the Darlington Forge Co., Ltd., which is just now engaged upon the forgings for the battleship Lord Nelson, about to be launched from Messrs. Palmer's ship building yard at Yarrow-on-Tyne. As a sample of the excellent railway contracts still being placed, the Leeds Forge Co., Ltd., has just obtained contracts for 74 bogie covered wagons for the Indian State railways while the Vulcan Foundry Co., Ltd., has booked 17 standard goods engines and one crane locomotive for the Oudh & Rohilkhund railway.

The improved trade is apparently being utilized for the sweeping away of a number of old established works. Among the establishments now offered for sale by auction in South Staffordshire are the Tividale sheet mills and the Hecla and Etna works, Tipton, all very well-known establishments. Although fairly well equipped, they are generally speaking hardly up to modern requirements from the economical point of view.

The Master Car Builders' and the American Railway Master Mechanics' Associations will hold annual meetings simultaneously at Atlantic City, N. J., during the week begining June 13. There will be a miniature exposition on the steel pier, many manufacturers of railway supplies having already engaged space for exhibits.

PUNCHING AND COPING PRESS.

A recently designed machine for coping beams and punching the webs and flanges of the same, has been brought out by the Geo. Whiting Co., Chicago, Ill. It is shown in the accompanying illustration. The machine has a capacity to cope beams up to 18 inches either in the flange or web, and the same attachment can be used for making irregular copes in the webs of beams.



BEAM PUNCHING AND COPING PRESS.

The machine is fitted with a flange and web punching attachment having four punch and die holders arranged for punching the flanges and webs of beams from six inches to 24 inches, 100-pound section inclusive. A set of blocks and punch holders is made, so that holes 2-inch centers can be punched in the flanges of 6-inch beams, and a set can be furnished for punching of 24-inch beams with holes 18-inch centers. To accomplish this range of punching, four punch and die holders are furnished, each punch holder being fitted with a separate gag, as shown in the illustration. The machine is capable of punching two holes one inch in diameter through one inch steel singly or double as desired, or of punching four holes at the same time that will not exceed this double punching capacity.

The illustration shows four punch and die holders set on the machine. It is commonly used, however, with but two of these in operation, one set, consisting of two punch and two die holders, being used for the heavier work, and the other set for the smaller diameter holes. As each set is fitted with a gag, one or two holes can be punched at the same time if desired by the operator.

The press is fitted with two strippers, one on each side. These strippers are especially designed for use on this machine and are adjustable. They are so made that flanges or webs can be punched without changing the stripper. The machine is furnished with a shortened back stand, and the flywheel is crowned for the belt from the driving motor. The shortened back stand is used in order to economize shop room. A foot treadle, brought out to the front of the machine, permits the operator to work on the end or the side of the punch, as most convenient. An arrangement at the bottom of the punch causes the punch wads falling from the beams to drop on each side instead of collecting at the bottom of the casting. This prevents blocking of the machine, and the operator is not required to stop work and brush them away.

The punch is fitted with an adjustable automatic stop. It is actuated by a pintle movement, having a cast steel pintle, bushed with phosphor bronze and set in a special slide designed for this type of punch. This tool can be made in different capacities, as desired, and has several features embodied in its construction, which were suggested to the maker by users of this type of machine. The bottom blocks are reversible, so that the flanges of 6-inch beams can be punched as well as the flanges of 24-inch beams. A substantial reinforcement at the bottom gives rigidity to the structure and avoids unnecessary springing when punching.

MOTOR DRIVEN WET TOOL GRINDER.

A motor driven wet tool grinder built by the J. G. Blount Co., Everett, Mass., is shown in the accompanying illustration. A two horsepower electric motor furnishes motive power for the machine. It is set on an extension of the base, and may be moved back or forth to tighten or loosen the driving belt, which is made endless. The rheostat for starting and stopping is placed in a convenient position at the side of the grinder.

The tool is provided with self-oiling bearings of large dimensions and can be run continuously without injury. This feature avoids the loss of time in starting and stopping. The water is supplied to the wheel by means of a vertical centrifugal pump, insuring a constant supply which may be regulated at will. The pump case is of snail shell design and the propeller is so loosely fitted that coarse sand may pass through it without injury and there is no wear of the moving parts.

A sleeve cap covers the pump case, which loosely encircles the pump shaft and extends to a point above the water line. This device prevents all leakage without the use of packing. The pump

BLOUNT MOTOR DRIVEN WET GRINDER.

spindle is driven by friction at its upper end, the friction disc engaging with the main driving pulley. It is mounted in bearings upon a forked carrier, the

lower end of which is pivoted to the pump case, the upper end being secured to jaws which hold the disc in contact with the edge of the driving pulley.

The pan is made large and deep to catch and return all surplus water to the tank in the column. A pan is set below the wheel to prevent grit and dirt from settling in the tank. The latter is easily removed for cleaning. The tank in the column carries a large supply of water, and is provided with an opening through which it may be cleaned if necessary. The hood, covering the wheel is brought well forward from the center, and prevents water from reaching the bearings or flying out upon the floor.

NEW ENGLAND FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the New England Foundrymen's Association was held at the Exchange Club, Boston, on Wednesday evening, May 9. Dinner was served at six o'clock, after which the routine business was disposed of in the usual manner, with President W. B. Snow in the chair.

Attention was called to the convention of the American Foundrymen's Association to be held in Cleveland on June 5, 6 and 7, and the members were urged to send a full representation from New England. The chairman appointed Messrs. Magee, Shaw and Stockwell a committee to make arrangements for attending the convention.

Announcement was made that the next meeting of the association would be held in the way of an outing at the Point Shirley Club, Winthrop, Mass. The president then introduced as the speaker of the evening, E. M. Taylor, of the Library Bureau, Boston, who discussed in a practical way "The Correct Application of True Burden to Iron Costs."

THE ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.

The Engineers' Society of Western Pennsylvania will hold the following meetings in May and June at its rooms, 803 Fulton Bldg., Pittsburg:

On May 18 and 19, it will entertain the Ohio Society of Mechanical, Electrical and Steam Engineers, the program being as follows: May 18, 10 a. m., meeting of O. S. M. E. and S. E., May 18, 2 p. m., excursion O. S. M. E. and S. E., May 18, 7:30 p. m., meeting of O. S. M. E., and S. E., May 19, 10 a. m., meeting of the O. S. M. E. and S. E., May 19, excursion of the O. S. M. E., and S. E.; Tuesday, May 22, 8 p. m., meeting of the structural section; Tuesday, June 5, 8 p. m., meeting of the mechanical section; Saturday, June 9, 7:30 p. m., meeting of the board of direction.

At the meeting of the structural section, a paper on "Coke and Ore Bin Construction," will be read by E. W. Pittman. The following papers are listed to be read at the meetings of the O. S. M. E. and S. E.: "A Pound of Water," Geo. G. Bennett; "Air Lift," Gustaf C. H. Friedreich; "Economical Lubrication of Large Plants," William Davis; "Gas Engine Driven Railway Cars," E. W. Roberts; "Shop Kinks," Willis Holloway. Other papers will also be presented by Prof. Hitchcock and Prof. F. C. Caldwell, both of the Ohio State University.

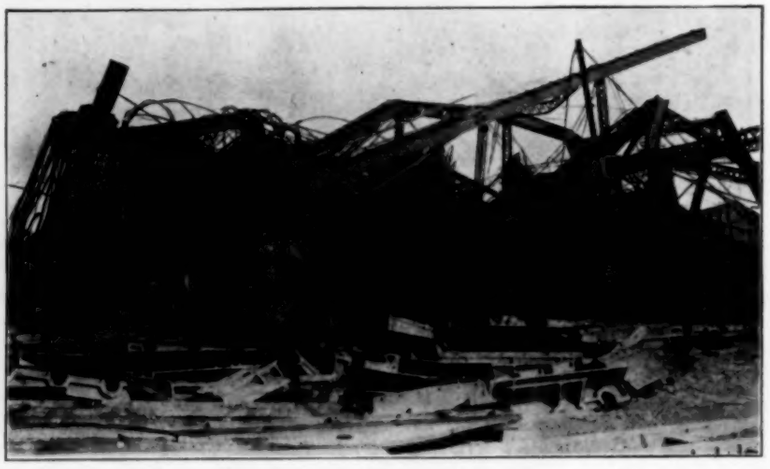
The American method of constructing a structural steel building is reported to be gaining favor in certain sections of Great Britain, particularly in Lancashire, where the steel frame is being largely employed in new cotton mills.

DESTRUCTION OF THE FERRIS WHEEL.

The Ferris wheel, which was an object of interest to the many visitors at the Chicago and St. Louis expositions was blown up at 4:30 in the afternoon of May 11 on the World's Fair grounds in St. Louis. One hundred pounds of dynamite was exploded underneath the supports on the north side of the structure, wrecking the foundation. It was the intention to have the wheel fall on one side, but, instead of this, it merely crumpled up slowly, and in a few minutes was a tangled mass of steel thirty or forty feet high. As the wheel settled, it turned slowly with the bottom of the wheel as a support, and then it slowly collapsed. The heavy axle dropped with the rest of the wheel, crushing the smaller braces and steel framework.

The accompanying illustrations show the wheel just as it was beginning to fall, and after all settling had taken place.

THE BEGINNING OF THE END.



THE FINISH.

THE DESTRUCTION OF THE FERRIS WHEEL AT ST. LOUIS.

Consul Brittain in writing from Kehl says: "Manufacturers of machine tools over Germany and France admit the excellence of the American product and gain all possible information from our manufacturers. Americans occupy the first rank in manufacturing machine tools in consequence of their thorough knowledge of the business and their aptness in showing their machines to the best possible advantage."

Consul Ellsworth reports that the president of Colombia has issued a decree admitting without duty iron and steel rails for railroads, iron in sheets or in pieces, mineral coal and Roman cement.

Stocks Recover from Recent Decline.

Practically a complete recovery, so far as values are concerned, from the extensive slump following the San Francisco disaster was accomplished on the stock exchanges during the past week. Dealing was fairly active and the tendency of prices was strongly upward, though an unfavorable bank statement on Saturday exerted a depressing influence and lost a small part of the week's gain. Several factors contributed to this recovering movement, the labor situation being exerted some influence in strengthening the stock market and the fact that a much better feeling prevailed in money circles, with both call and time rates easy, also played an important part. The total dealings of the week were slightly less than 6,500,000 shares on the New York exchange. Four securities made up more than half this business; United States Steel with 1,184,800 shares, Reading with 1,027,400 shares, Union Pacific 807,600 shares and Amalgamated Copper 763,900 shares. Few securities failed to net at least a moderate advance and in the case of a number of railway stocks the advance in prices was more than 10 points. American Locomotive, Colorado Fuel & Iron, Republic Iron & Steel, International Pump and Pullman securities were dealt in to a considerable extent and closed well over the prices of the preceding week. Amalgamated Copper gained six points on an advance in the price of raw copper.

tremely important in shaping trading. The failure of the longshoremen's strike and the settlement of difficulties in the anthracite coal region gave steel and furnace interests assurance of an ample supply of raw materials through the season and removed the possibility of an iron shortage at a time when it threatened early and serious embarrassment to a wide range of industries. The improvement in the iron and steel field following this clearing of the labor outlook also ex-

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quotation May 5	Closing Quo. May 12	Changes	Date of 1906 Ann. Meet.	Par Value	Capital Outstanding	Dividend Basis	Dividend Being Paid	Dividend Date Last Div. Dec.
Allis-Chalmers Co	21	21⅛	+ ⅛	Sept.	100	19,820,000		.....	.....
Allis-Chalmers preferred	55⅝	57	+1⅜		100	16,150,000	7 cum	.....	Feb., 1904
American Can	7⅛	8⅛	+1	Apr. 24	100	41,233,300		.....	.....
American Can preferred	61	65	+4		100	41,233,300	7 cum	5 Q.	Apr., 1906
American Car and Foundry	38½	40⅞	+2⅜	June 28	100	30,000,000		.....	May, 1905
American Car and Foundry preferred	100¾	102¾	+1¼		100	30,000,000	7 n. c.	7 Q.	Jan., 1906
American Locomotive	60½	67⅛	+6⅝	Oct. 16	100	25,000,000		.....	.....
American Locomotive preferred	112⅝	114⅛	+2		100	24,100,000	7 cum	7 Q.	Apr. 1906
American Shipbuilding	55	56½	+1½	Oct. 2	100	7,600,000	4	4 Q.	Apr., 1906
American Shipbuilding preferred	106	104	−2		100	7,900,000	7 n. c.	7 Q.	Jan., 1906
American Steel Foundries	10⅜	11⅝	+ ⅜	Oct. 3	100	17,700,000		.....	.....
American Steel Foundries preferred	45⅛	45¾	− ⅛		100	17,700,000	6 cum	.....	Aug., 1905
Barney & Smith	65	65	.....	June 5	100	1,000,000		.....	June, 1894
Barney & Smith preferred	140	140	.....		100	2,500,000	8 cum	8 Q.	Mch., 1906
Bethlehem Steel	26½	27¾	+ ¾	April 3	100	15,000,000		.....	.....
Bethlehem Steel preferred	85	87	+2		100	15,000,000	7 n. c.	7 Q.	May, 1906
Bullock Electric preferred	111	111	.....	Oct. 2	100	1,000,000	6	6 Q.	Jan., 1906
Cambria Steel	34¾	35	+ ¼	March 20	50	45,000,000	6	7 Q.	Mar., 1906
Cambria Iron	49⅞	49⅞	.....		50	8,468,000	4	4 S. A.	Apr., 1906
Colorado Fuel & Iron	45⅝	51¾	+5⅛	Oct. 15	100	30,132,000	7	.....	Apr., 1902
Wm. Cramp & Sons Ship & Eng. Bldg. Co.	25	25	.....	May 31	100	6,098,000	5	.....	Nov., 1902
Crucible Steel	13⅝	14	+ ⅜	Oct. 17	100	25,000,000		.....	.....
Crucible Steel preferred	79¼	80½	+ ⅜		100	25,000,000	7 cum	.....	Sept. 1903
Empire Steel	7	7	.....	Feb. 28	100	2,281,400		.....	.....
Empire Steel preferred	35	35	.....		100	2,500,000	6 cum	3 S. A.	Jan., 1905
Fay & Egan	93½	93½	.....	Feb. 20	100	1,000,000	5	5 Q.	Nov., 1905
Fay & Egan preferred	128½	128½	.....		100	1,000,000	7 cum	7 Q.	Nov., 1905
General Electric	166½	167¾	+1¼	May 8	100	48,256,050	8	8 Q.	Jan., 1906
International Pump	54	58	+4	June 5	100	12,202,500		2	July, 1905
International Pump preferred	85¾	90⅝	+4⅞		100	8,850,000	6 cum	6 Q.	May, 1906
Lackawanna Steel	71	71	.....	March 14	100	34,971,400		.....	.....
Lake Superior Corporation	18½	19½	+1	Oct. 3	100	40,000,000		.....	.....
Niles-Bement-Pond	130	130	.....	Feb. 7	100	5,000,000	6	6 Q.	May, 1906
Niles-Bement-Pond preferred	105	105	.....		100	2,000,000	6 cum	6 Q.	Mch., 1906
Otis Elevator Co	52	52	.....	March 19	100	6,350,300		2 A.	Apr., 1906
Otis Elevator Co. preferred	100	100	.....		100	5,589,500	6 n. c.	6 Q.	Apr., 1905
Pittsburg Coal Co	13⅝	13⅝	.....	Feb. 12	100	30,135,000		.....	.....
Pittsburg Coal preferred	54	54	.....		100	30,716,200	7	.....	Apr., 1905
Pressed Steel Car	47½	51⅝	+4⅛	Feb. 21	100	12,500,000		3	Aug., 1904
Pressed Steel Car preferred	97	97¾	+ ¾		100	12,500,000	7 n. c.	7 Q.	May, 1906
Pullman Palace Car	221	228	+7	Oct. 18	100	74,000,000		8 Q.	Feb., 1906
Railway Steel Spring	50	53	+3	March 1	100	13,500,000		4 S. A.	Oct., 1905
Railway Steel Spring preferred	99½	102	+2½		100	13,500 000	7 cum	7 Q.	Apr., 1905
Republic Iron & Steel	26¾	29	+3¼	Oct. 17	100	27,352,000		.....	.....
Republic Iron & Steel preferred	95⅞	102⅝	+6¾		100	20,852,000	7 cum	7 Q.	Apr., 1906
Sloss-Sheffield	74¼	79¼	+5	March 14	100	7,500,000	5	5	Jan., 1906
Sloss-Sheffield preferred	111	112	+1		100	6,700,000	7 n. c.	7 Q.	Jan., 1906
Tennessee Coal & Iron	144½	147½	+3	May 15	100	22,552,800		4 Q.	Apr., 1906
U. S. Cast Iron Pipe & Foundry	46⅝	49⅛	+2½	June 27	100	12,500,000		2	June, 1906
U. S. Cast Iron Pipe & Foundry preferred	92	92½	+ ½		100	12,500,000	7 n. c.	7	June, 1906
U. S. Steel	39½	41½	+2	April 16	100	508,302,500		.....	Dec., 1903
U. S. Steel preferred	106	106	.....		100	360,281,100	7 cum	7 Q.	Feb., 1905
U. S. Steel 5's	99	97¼	−1¾		100	463,798,000	5	5 A.	
Virginia Iron, Coal & Coke	43¼	43	− ¾	Sept. 18	100	8,641,600		.....	.....
Westinghouse Electric	156	158	+2	June 27	50	20,996,350	10	10 Q.	Apr., 1906
Westinghouse Air Brake	150	149	−1	Oct. 2	50	10,990,450	20	20 Q.	Apr., 1906

FINANCIAL NOTES.

The Barney & Smith Car Co. has declared the regular quarterly dividend of 2 per cent on preferred stock, payable June 1.

Denial is made of the widely circulated reports that the securities of the Bethlehem Steel Corporation are to be listed on the New York exchange.

The right to subscribe to the $400,000 bonds and $200,000 preferred stock of the Columbus & Hocking Coal & Iron Co. has expired and it is understood that none of the stockholders took advantage of the offer. The entire issue will be taken care of by the underwriters.

The American Locomotive Co., it is reported, may begin the payment of dividends on its common stock during the year.

The American Steel & Wire Co., of New Jersey, has filed with Massachusetts authorities a statement showing assets Feb. 28 to be $128,573,760.

NEWS FROM MANY INDUSTRIES.

New Buyers:—

The Sharpsville Furnace Co., Sharpsville, Pa., has been incorporated with a capitalization of $100,000 by Alexis W. Thompson, formerly president of the Republic Iron & Steel Co., Edwin N. Ohl, and Frank Pierce. The Sharpsville furnace has been purchased and will be put in blast at an early date.

The Columbus Auto Axle Co., Columbus, O., recently incorporated for $225,000, has reincorporated as the Direct Drive Axle Co., with a capital stock of $150,000. A factory will be erected for the manufacture of an improved automobile axle, the invention of Irvin M. Pleukharp, one of the incorporators.

The Republic Stamping & Enameling Co., Canton, O., has been incorporated with $400,000 capitalization by C. H. Knight, E. K. Soler, L. A. Loichot, W. E. Saxton, and J. B. Saxton.

The Toledo Furnace Co., Cleveland, which is adding a new stack to its plant at Toledo, O., has increased its capital stock from $1,350,000 to $2,000,000.

The Birmingham Iron Co., New York, has filed a certificate of incorporation for $2,000,000 with the secretary of state. The directors are: Willoughby L. Webb, J. Frederick Kernochan, president of the Astoria Steel Co., and Frank A. Lord, all of New York.

The Victor Foundry Co., Hamilton, O., has been incorporated with a capital of $25,000 by Harry V. Moore, Gustav Sauer, Sigmund Sauer, Charles Muller and Morris Sauer.

The Rehard Coal & Coke Co., Connellsville, Pa., has been organized with a capitalization of $100,000 by Joseph B. Rehard, Cyrus Rehard, Joseph T. Johnson and David B. Evans.

William Fleming's Sons, New Castle, Pa., manufacturers of boilers, have been incorporated with a capital of $10,000 by James C. Fleming and Robert E. Fleming, of New Castle, and John Fleming, of Sharon.

The Jackson-Church-Wilcox Co., Saginaw, Mich., has been organized with a capitalization of $25,000 for the manufacture of high grade machinery and auto delivery cars.

The Wyland-Newman Machine Co., Greensboro, Pa., has been incorporated with a capital of $100,000. The officers are: George C. Wyland, of Williamsport, Pa., president; R. S. Petty, vice president, and George F. Newman, secretary-treasurer, both of Greensboro.

The Butler Foundry Co., Hamilton, O., has been incorporated with a capital of $10,000 by Louis A. Flume, Charles C. Friebel, Bernard M. Fuersich, George J. Fuersich, and Henry Schuhaus.

The American Steel Fence Post & Mfg. Co., Fort Worth, Tex., has been incorporated with a capitalization of $25,000 to manufacture fence posts, etc. The incorporators are: Sam A. Joseph, J. M. Marsh, and A. F. Luckett.

Wahl & Co., Omaha, Neb., have been organized with a capital of $50,000 to buy and sell real estate, mining machinery, etc. The incorporators are: William Frederick Wahl and Howard Blaine Wahl, both of Omaha.

The Buffalo Machinery & Supply Co., St. Louis, Mo., has been incorporated with a capitalization of $25,000 to do a jobbing business in machinery and machinery supplies. The incorporators are: George W. Destaebler, Christian F. Hershey, and Henry D. Crawford.

The Pacific Steel Co., Kirkland, Wash., has been incorporated with a capital of $350,000 by J. F. Duthie, William Calvert Jr., and L. S. Cragin.

The Beaver Dam Malleable Iron Co., Milwaukee, Wis., has increased its capital stock from $100,000 to $200,000. S. W. Lamoreaux is president of the company, and E. S. Mason, secretary.

The Mandt & Powell Concrete Machinery & Foundry Co., Stoughton, Wis., has been incorporated with a capital of $24,000. The incorporators are: M. G. Mandt, G. G. Mandt, and John Evans.

The M. Kelly Iron & Metal Co., Inc., Richmond, Va., has been organized with a capital stock of $50,000 to deal in iron and other metals. The officers are: M. Kelly, president; John Kelly, vice president, and D. O'Sullivan, secretary-treasurer, all of Richmond, Va.

The J. B. Foote Foundry Co., Fredericktown, O., has been incorporated with a capital of $40,000 by James B. Foote, Hermine B. Reynolds, L. W. Dennis, W. D. Foote, and Hermine E. Foote.

The Southwestern Mine & Mill Co., Chicago, Ill., has been organized with a capitalization of $20,000 for the manufacture of all kinds of mill machinery, including saw and grist mills. The company purchased a plant on South Fifth street, and will make a specialty of the manufacture of goods largely used in that section. The incorporators are: W. A. Butterfield, president; Ben Wood, and J. B. Parkinson.

The Cyclone Fence Co., Waukegan, Ill., has been incorporated with a capital stock of $100,000 to manufacture wire fencing. The incorporators are: Joseph P. Arthur, R. R. Reaume, and Joseph Slomer.

The West Steel Casting Co., Cleveland, O., has been incorporated with a capital of $10,000, by Ralph H. West and others.

The Wayne Gear Co., Ft. Wayne, Ind., has incorporated for $10,000 to manufacture transmitting machinery with Maurice I. Rosenthal, Joseph Frieburger, and W. H. Olds as directors.

The Jamestown Machine Co., incorporated in New York, will manufacture engines, machinery, etc. The capital stock is $30,000, and the incorporators are Charles Jacobson, Edwin O. Jenkins, Warren, Pa.; Karl Peterson, John P. Danielson and Charles S. Trover, Jamestown, N. Y.

General Industrial Notes:—

The Chicago plant of the Westinghouse Machine Co. has been moved to Attica, N. Y., where a considerable saving in freight rate will be secured and the benefit of power from Niagara can be taken advantage of.

The Kellogg-McCrum-Howell Co., Uniontown, Pa., has been changed to the McCrum-Howell Co., the interest of C. B. Kellogg of New York having been purchased by the other two principal stockholders. L. J. McCrum assumes the position of president and will continue as treasurer. Geo. D. Howell is vice president and Howard T. Gates, secretary. The company owns a radiator works at Uniontown, Pa., and a boiler factory at Norwich, Conn., and is completing an enameled ware plant at Uniontown.

The Rogers-Shear Co., Warren, Pa., has installed a rolling mill in connection with the Franklin Rolling Mill & Foundry Co., of Franklin, Pa., for the manufacture of high carbon steel bars for the reinforcing of concrete. The mill is especially equipped for this work, and for the present will manufacture nothing but bars.

The George Haiss Mfg. Co., 141st street and Rider avenue, New York, recently incorporated, takes over the business established in 1893, but not incorporated. A new shop, four stor-

ies of brick, was erected last year, and the area of ground to work on was materially enlarged. The company is making a new departure in the manner of constructing coal pockets, using steel reinforced concrete throughout instead of timbers. About three-fourths of the company's construction work is in New York and its environs.

The Battle Creek Iron Works Co. property has been sold to W. G. Hay, of Battle Creek, Mich., representing some of the bondholders, for $31,140. This is the result of a chancery foreclosure decree recently issued.

The turnbuckle plant of the Republic Iron & Steel Co., now located at Brazil, Ind., is shortly to be removed to Muncie.

The Wheatland, Pa. rolling mill of the Shenango Iron & Steel Co. is in full operation with about 300 men employed.

At a meeting of the stockholders of the Vulcan Detinning Co. held in Jersey City, N. J., May 3, all the retiring directors were re-elected. The statement for the year ending March 31, 1906, showed a gain in surplus of $119,000 after deducting for dividend payments and a considerable outlay for the construction of new plants.

The Baldwin Locomotive Works have purchased the plant of the Gruson Iron Co., Eddystone, Pa., from Thomas Prosser & Sons, of New York. The sale was effected through David Thompson who built and operated the plant for a time. The Baldwin interests will use it as a foundry and improvements and extensions are said to be in contemplation. The plant was erected several years ago to build turrets for the government but was operated only a short time.

New Construction:—

The Penberthy Injector Co., Detroit, Mich., is soon to begin work on a large addition to its present plant and a separate office building. These improvements will increase its capacity about 50 per cent.

A. F. Bartlett & Co., Saginaw, Mich., builders of Corliss engines and coal mining machinery, are constructing an addition to their present foundry which will increase their capacity more than one-third. The addition will be modernly equipped and will be operated as a custom foundry.

The Springfield Foundry Co., Springfield, Mass., has outgrown its present plant and will shortly begin work on a brick and steel building 102 x 275 feet. The new structure will cost about $80,000, and will be ready for operation by early fall. The company was incorporated in 1877, and its present officers are: W. F. Callender, president; David Hale, treasurer, and James Hale, secretary.

The American Valve Co., Coxsackie, N. Y., which recently incorporated under New York laws, has let the contract for a new iron foundry which will cost about $12,000 and will be ready for occupancy Aug. 1.

The Ward Fence Co., now located at Portland, Ind., is to remove to Marion, Ind., through the efforts of commercial clubs in that city. A new plant will be erected, the main building being 80 x 200 feet.

The Rockford Malleable Iron Works, which is to erect a new plant along the line of the C. B. & Q. railroad, at Rockford, is soon to begin the work of construction. The main building will be 140 x 460 feet, with a large warehouse, office building and a number of other structures. A site of 15 acres has been secured, affording ample room for expansion.

The M. J. Drummond Co. is to construct a large iron pipe plant on a tract of land recently acquired at Norfolk, Va.

The East Liverpool Foundry, Machine & Supply Co., East Liverpool, O., which was recently incorporated, is operating its old plant at that place. Work is to commence within a short time on a new foundry and a two-story machine shop, for which equipment will be purchased. Geo. A. Anderson is general manager.

The Chas. E. Miller Co., which recently incorporated to conduct a foundry business, is completing a plant at Twenty-eighth street and First avenue, New York city. It will have about 8,000 square feet of floor space, and will employ 75 men at the start.

The Marion Steam Shovel Co., Marion, O., has just completed two large additions to its shops, which, with improved equipment, will enable it to ship nearly 50 machines per month. It is now shipping between 25 and 30 shovels per month, in addition to dredges, etc., the largest output in its history.

Schumacher & Boye, machine tool manufacturers of Cincinnati, have purchased the property formerly occupied by the Dreses Machine Tool Co., whose plant burned in March. This property is adjacent to the present plant of Schumacher & Boye, who will at once begin the erection of a modern concrete building 75 x 200 feet and a power plant 63 x 100 feet.

The Seattle Car Co., Seattle, Wash., has increased its capitalization to $100,000, and will begin the construction of a new plant within the next 60 days. William Pigott, of Seattle, is interested.

The David Bradley Mfg. Co., plow and implement manufacturer of Bradley, Kankakee county, Ill., has begun improvements which will double the size of its present foundry. A department will be fitted up for the making of malleable and semi-steel castings and fittings.

The Southwestern Iron Co., Guthrie, Okla., has begun operations in its new foundry which is 60 x 80 feet and well equipped. A machine shop 40 x 120 feet adjacent to the foundry is to be used in manufacturing boilers. C. H. Martindale is president and general manager.

The Canada Tin Plate & Steel Co., Morrisburg, has its new plant near completion. The main building is 160 x 800 feet of stone and structural steel construction. With equipment the mill represents an expenditure of about $700,000. It will have a capacity of 30,000 tons a year, and the machinery will have additional capacity to carry an overload of one-third, should trade requirements be sufficiently heavy. The plant will be operated by electricity, the town of Morrisburg providing free power for 20 years. G. H. Meldrum is president of the company which has been promoted by J. Wesley Allison.

Plans have been completed by the Witte Iron Works Co. for a gas engine manufacturing plant at Kansas City, Mo. The company is now located at Fifth and Penn streets, but has outgrown its present quarters, and will locate in the new manufacturing district.

The Grand Rapids Hand Screw Co., Grand Rapids, Mich., which has occupied a leased plant for some years, has acquired a site on which it will erect a plant of its own. The buildings, however, will not be erected until next year.

The American Steel & Wire Co. has taken out permits for the erection of four additional buildings at its South Works in Quinsigamond, near Worcester, Mass. The estimated cost is $109,000.

The American Can Co. has completed plans for a three-story brick structure 85 x 225 feet, and an adjoining engine house, which it is to erect at New Orleans.

The Davison-Namack Foundry, Ballston, Spa., N. Y., has plans completed for a $10,000 foundry which is to be built along the tracks of the Delaware & Hudson railroad. Citizens of the village are to furnish the site.

The Livermore Foundry & Machine Co., Memphis, Tenn., is making extensive repairs and installing new machinery which will largely increase its capacity. L. E. Traylor was recently made general manager.

Fires and Accidents:—

The Severance Mfg. Co., Glassport, Pa., lost its plant by fire May 10, the loss being placed at about $60,000. The adjacent plants of the Pittsburg Steel Hoop Co. and the Pittsburg Foundry Co. escaped damage.

The plant of the Michigan Pipe Co., Bay City, Mich., recently destroyed by fire, will be rebuilt and it is expected operations can be resumed within 90 days.

A. Merle & Co. sustained a complete loss of their plant at San Francisco in the recent disaster, but are erecting a building and will resume business actively by June 1. Their present address is 220 Bay street.

The bursting of a water pipe caused a terrific explosion at the plant of the Girard Iron Co. May 7. Several workmen were injured and operation at the furnace temporarily delayed.

Fire in the core and shipping room of the Scullin-Gallagher Iron & Steel Co., St. Louis, did about $10,000 damage April 29. The loss was chiefly through the destruction of several dynamos and other machinery, patterns, molds, tools and finished products. The fire will not interrupt the work of the plant, which is being greatly enlarged.

Trade Notes:—

The Northern Engineering Works, crane builder of Detroit, Mich., has recently installed one 10-ton and one 20-ton electric traveling crane, each of 50-foot span, in the new foundry of the Russel Wheel & Foundry Co., Detroit. It supplied the Continental Stove Co., Richmond, Va., with a Newten patent cupola of 14 tons hourly capacity.

The General Pneumatic Tool Co. reports a large number of "repeat" orders in hoisting equipment, strongly emphasizing the merits of its Shepard electric hoists.

The New York Air Brake Co. has taken an order for brakes for 1,000 cars from the St. Paul railroad. It is also equipping 1,000 additional cars for the Panama railroad and 50 cars for the Clover Leaf.

The Independent Pneumatic Tool Co. has been forced to secure larger quarters for its Pittsburg and New York offices. The Pittsburg office has been removed from the second floor of the Germania Bank building to the twelfth floor of the Farmers' National Bank building, and the New York office from the thirteenth to the sixteenth floor of the Broadway-Maiden Lane building, 170 Broadway. A complete line of Thor pneumatic tools and appliances and extra parts will be carried at these offices.

TRADE PUBLICATIONS.

The Robbins Conveying Belt Co., Park Row Bldg., New York, is distributing bulletin No. 14 describing the Robins belt conveyors for handling excavated earth and rock and concrete materials. The bulletin comprises 24 pages illustrated with photographs of actual installations.

The National Machinery Co., Tiffin, O., in bulletin No. 20, describes a line of "National" multiple spindle bolt cutters. These range in size from one inch to two and one-half inches double cutters; one and one-half to two inches triple cutters, and various other machines for cutting and threading nipples, staples, etc., are shown. Detailed views of the various parts are shown, together with descriptions of special features. A number of tables of dimensions are incorporated in the bulletin.

The Wellman-Seaver-Morgan Co., Cleveland, is distributing a catalog describing locomotive cranes, buckets and tubs. The book comprises 32 pages 6 x 9 inches, and describes a very complete line of locomotive cranes, adapted for various uses. The cranes shown are for use in excavating, coal handling, transportation of machinery, handling ashes, loading boats, etc. The book also describes the Hulett patent grab bucket and a line of dumping tubs.

The Ingersoll Milling Machine Co., Rockford, Ill., is distributing catalog No. 15, describing heavy milling machines. The catalog comprises 70 6 x 9 pages and covers a wide range of machinery. The tools shown vary from 20 x 20-inch removable housing machines to 10 foot, 4-head milling machines. A great many different styles and sizes in between these two are listed. Some of the machines which may be mentioned are:—a double vertical spindle milling machine with removable outer housing, duplex, horizontal spindle milling machine with or without swivelling heads, combined horizontal and vertical milling machines, 48 x 48-inch heavy double vertical spindle milling machine, horizontal spindle milling machine with extended cross rails, etc.

The Electric Controller & Supply Co., Cleveland, is distributing two bulletins, 101 and 102, describing respectively the Dinkey ventilated controllers and type-U controllers. The bulletins each consist of a series of loose leaves bound in a cover, each leaf bearing either an illustration or a set of specifications of one of the many types of controllers described.

The Schellenbach & Darling Tool Co., Cincinnati, is distributing a catalog describing reamers and special tools. A large line of reamers is described and illustrated, the tools including universal, adjustable blade shell reamers, ranging in diameter from 1½ to six inches; universal adjustable blade hand reamers; universal adjustable blade machine reamers, ranging from 1¼ to three inches; adjustable blade roughing reamer for machine work, etc. The catalog comprises about 35 pages and contains considerable information of value regarding reamers.

The Ingersoll-Rand Co., New York, is distributing several publications relating to compressed air and air compressors. The catalog is entitled "The Imperial Type X Air Compressor," and includes a detailed description of this machine. This compressor is designed to be highly automatic in action, and is built with compound steam and air cylinders or with duplex steam and air cylinders, compound steam and duplex air compressors or duplex steam and duplex air cylinders. Another booklet deals with compressed air pumping systems and describes the air lift pump, together with its advantages. The third publication deals with the Ingersoll-Rand air and gas compressors and lists a rather extensive line.

The Yale & Towne Mfg. Co., Stamford, Conn., describes the Yale & Towne portable electric hoists in a recently illustrated catalog. The hoist is thoroughly illustrated and described, and a list of uses to which it may be put is given. Among these uses are the handling of coal and ashes, ice, slag, pipe, cordage, logs, theatre scenery, building materials, structural work, car bodies, elevator platforms, molten metal, foundry copes, flasks, patterns, etc., serving of mills, water works, printing presses, engine and boiler rooms, machine tools, contractors; erecting machinery and stone work; charging cupolas, etc. The hoists listed range in capacity from one to six tons and are supplied with motors for voltages ranging from 100 to 250.

The Struthers Furnace Co., Cleveland, O., has issued a handsome bulletin setting forth the merits of its cement manufactured from the slag of its blast furnace at Struthers, O. Tests of the cement are incorporated and views of the material employed in various ways are shown. A feature is made of its fireproof qualities and its adapability for railway abutments, retaining walls, dam construction and street paving. The booklet is the work of A. C. Green, advertising manager of the company.